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ABSTRACT

This monograph offers information, suggestions, and proposals to teachers, students, and citizens to increase their understanding of the aging process in both its physical and psychosociological aspects. Part I, What Is Aging? examines various aspects of aging, some of its major characteristics, and what it is like to grow old in the U.S. today. Part II is concerned with the physical aspects of aging: how the body changes; the aging processes of human cells, human tissue, and organ systems; aging and disease; some theories on why aging takes place; and suggestions on how to deal constructively with aging. Part III examines some psychosociological aspects of aging, with emphasis on ways to encourage continued psychological and social involvement with the rest of the world. Appendixes provide details of resources for additional information. Appendix A describes programs for senior citizens, specifically those provided by ACTION and the Department of Labor. Appendix B lists materials available free from the Administration on Aging. Appendix C gives the locations of all regional and state agencies on aging. (MBM)

PREPARING TEACHERS, STUDENTS AND CITIZENS TO DEAL CONSTRUCTIVELY WITH THE PROBLEMS AND POTENTIALITIES OF AGING

by
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PREFACE

This monograph is directed toward teachers, students and citizens, a rather comprehensive group, to say the least. It is hoped that the information, suggestions and proposals that follow will prove beneficial to all of these people both in their professional capacities and in their personal lives. Since millions have lived out their lives without the benefit of any formal education about aging, one might doubt the necessity of such study. However, as the numbers of older Americans has become increasingly large and the health and psychosociological problems they face, increasingly evident, it seems that our educational system has perhaps been neglectful in preparing Americans to live a full, satisfying life throughout their years. Take, for example, the questions college students have presented in my classes on aging during the past five years. These students, in their junior and senior years of college, have not yet discovered answers to such basic and most important questions as: What can an individual do to be healthy in his older years? Physiological changes in aging--what are they? How do they affect the person? Is there such a thing as the "male menopause"? Why does the body age and slowly deteriorate? Are there maybe some advantages of aging? What can be done or how can society better meet the needs of the aging? How does society affect the aging process? What is the relationship between becoming old and being lonely? What about sexuality in older people? What are the causes and prevention of senility? What are the effects of arthritis on the aged? What feelings do elderly people (above retirement age) have toward getting help from other people? Unfortunately, complete answers to all the questions are not yet known. But if these bright students have reached almost the end of the college days without receiving any education on the aging process, one can only presume that the American population as a whole is largely ignorant of what to expect, what to plan for and how to adjust and adapt to the physical and psychosocial changes that accompany growing older. Such ignorance, combined with the plethora of myths that have created the "invalid model" (102)* of aging, has deprived many older Americans of the realization of their capacities and potentials and deprived society of a wealth of experience and energy. Education obviously cannot alone remedy this situation, but it can play a significant role.

The content of this monograph is introductory rather than exhaustive. It provides an overview of the aging process and some of its problems and potentials, in both the physical and psychosociological aspects. However, the physical aspects of aging are decidedly emphasized in order to complement ERIC's already abundant listing in the psychosociological aspects. Only those psychosociological factors that seem to have a pronounced impact on health and well-being are reviewed. Supplementary references to agencies and organizations providing instructional materials and/or assistance with problems and programs for the elderly have also been included.

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*Numbers in parentheses refer to bibliographic references.

Hopefully, it will become evident to the reader that although aging is often thought of as a lifelong downhill slide that keeps picking up speed, in fact, there are actually improvements and potentials accompanying aging that shouldn't be missed, misused or lost. Thus, dealing constructively with aging may at one point refer to preventive or preserving behavior; at another point, adjusting and adapting behavior; and at yet another point, active, productive behavior.

Assuming that awareness is a prerequisite to self-determination, it is hoped that the reader will find in the following pages an increasing awareness of his potentials and capacities as his life progresses, and thus be able to harness and maximize these to create for himself a meaningful existence regardless of age.

ABSTRACT

This monograph offers information, suggestions, and proposals to teachers, students, and citizens to increase their understanding of the aging process in both its physical and psychosociological aspects. Part I, What Is Aging? examines various aspects of aging, some of its major characteristics, and what it is like to grow old in the U.S. today. Part II is concerned with the physical aspects of aging: how the body changes; the aging processes of human cells, human tissue, and organ systems; aging and disease; some theories on why aging takes place; and suggestions on how to deal constructively with aging. Part III examines some psychosociological aspects of aging, with emphasis on ways to encourage continued psychological and social involvement with the rest of the world. Appendixes provide details of resources for additional information. Appendix A describes programs for senior citizens, specifically those provided by ACTION and the Department of Labor. Appendix B lists materials available free from the Administration on Aging. Appendix C gives the locations of all regional and state agencies on aging.

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TOPIC: *Preparing Teachers, Students and Citizens To Deal Constructively with the Problems and Potentialities of Aging.*

DESCRIPTORS

*Older Adults; *Senior Citizens; *Retirement; *Physical Health; *Mental Health; Psychology; Physiology; Death; Nutrition; Growth Patterns; Scientific Research

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*Asterisk indicates major descriptor.

PART I

WHAT IS AGING?

What is the process of aging all about? Exactly what does this word aging mean? Perhaps one of the more famous descriptions of the aging process was written around 1600 by William Shakespeare in his play *As You Like It*, Act II. Scene VII:

> All the world's a stage
> And all the men and women merely players.
> They have their exits and their entrances;
> And one man in his time plays many parts,
> His acts being seven ages. At first the infant,
> Mewling and puking in the nurse's arms.
> And then the whining school-boy, with his satchel
> And shining morning face, creeping like snail
> Unwillingly to school. And then the lover,
> Sighing like a furnace, with a woeful ballad
> Made to his mistress' eyebrow. Then a soldier,
> Full of strange oaths, and bearded like the pard;
> Jealous in honor, sudden and quick in quarrel,
> Seeking the bubble reputation
> Even in the cannon's mouth. And then the justice,
> In fair round belly with good capon lined,
> With eyes severe and beard of formal cut,
> Full of wise saws and modern instances;
> And so he plays his part. The sixth age shifts
> Into the lean and slipper'd pantaloon,
> With spectacles on nose and pouch on side;
> His youthful hose, well saved, a world too wide
> For his shrunk shank; and his big manly voice,
> Turning again toward childish treble, pipes
> And whistles in his sound. Last scene of all,
> That ends this strange eventful history,
> Is second childishness, and mere oblivion,
> Sans teeth, sans eyes, sans taste, sans everything.

Apparently the aging process has changed little since Shakespeare wrote these words, for more recent researchers and writers in the field of aging have described aging quite similarly, although certainly not so poetically. In asking the question, "What's the essence of aging?" Bertolini (11, p. 5) wrote, "We know for sure that it is a universal phenomenon; the result of changes induced by time in living matter." Thus, aging may be regarded as a part of life itself, from conception to death. In a sense, growth and development are also stages of aging, preparatory to atrophy and degeneration. Strehler (93) and Shock (90) have likewise described aging as a "universal phenomenon." In her characterization of aging, Bennet (9, p. 127) depicted two aspects. Biologically, she said, aging

could be viewed as "mental and physical and functional deterioration, either natural or pathological" and sociologically, "as a process accompanied by social isolation, voluntary and involuntary." She proposed that "voluntary" isolation occurred as one's energy level decreased and one removed oneself from society; "involuntary" isolation resulted from death of one's peers, forced retirement, the mobility of modern day families and so on. Finally, Birren (13, p. 119) described aging as a "characteristic pattern of late life change ultimately distinguishable from disease and adventitious consequences of existence, and eventually shown by all persons, though varying in rate and degree."

These descriptions of aging are quite typical of views presented throughout the literature; man has apparently found aging to be a process beginning at the moment of conception and continuing throughout life; a process from which no man escapes; a process characterized initially by growth and development and then progressive decline and deterioration, confounded eventually by pathological processes; a process which varies in the rate and degree to which it affects man; and a process which touches all aspects of one's being--the physical, the psychological, and the sociological.

"AGING" TERMINOLOGY

It is doubtful that most people think of the aging process in such broad terms, i.e., as beginning with conception, but rather view it as occurring after one has grown up or reached adulthood. The same delimitation has been adopted by researchers of the aging process, for obvious practical reasons. Intense examination of the life process over the span of years from adulthood to death is a monumental task in itself without adding to it the preceding stages of growth and development. To be precise, then, the study of aging, which has only been intensely pursued in the last 20 years, has largely been a study of senescence. Birren (12, p. 119) has defined senescence as the "aging of the mature individual or the process of unfavorable progressive change, usually correlated with the passage of time and terminating in death." This is strikingly similar to the definition of gerontology proposed by the Gerontological Society (12, p. 119): "gerontology is that branch of knowledge which is concerned with situations and changes inherent in increments of time, with particular reference to post maturational changes." Thus, most researchers of the aging process, delimited to the period of senescence, are engaged in the development of the field of gerontology and are properly called gerontologists. It should be noted, however, that some researchers, e.g., cellular physiologists, do attempt to examine the entire life processes, with the ultimate purpose of learning more about senescent phenomena.

To clarify further some of the terminology encountered in the literature on aging, the term senescence should not be confused nor equated with senility, the latter being a psychopathological development (22, 82) usually observed in late life among comparatively few of the aged, at least in its extreme form. Nor should gerontology be confused with geriatrics, the latter term referring to the medical specialty of treatment of diseases of the elderly. One should not be confused by such terms as social gerontology, psychological gerontology, biological gerontology and

so on. Indeed, by its very nature, gerontology as the study of senescence must encompass all aspects of life and thus, has become an interdisciplinary science, involving the physiologist, medical practitioner, nutritionist, psychologist, and psychiatrist, sociologist, geneticist, biologist and many others.

One should note, however, that the term aging or aging process is used quite often by writers in apparent preference to the term gerontology. It is not at all uncommon to encounter such phrases as "biological aspects of aging" or "psychological aspects of aging" and so forth; in such cases, the aspects referred to are those of senescence as opposed to the entire life span. The continuing popularity of the word aging as opposed to senescence or gerontology is due perhaps to its prevalent colloquial use in reference to senescence, and/or perhaps its euphemistic quality. This writer prefers the word(s) aging or aging process; thus, where these terms are encountered in this monograph, they refer to senescence or the gerontological process.

ASPECTS OF AGING

No aspects of man's life seems immune to the aging process. It is not surprising, then, to find that aging in man has come to be categorized in three general ways: biologically, psychologically, and sociologically. Biological aging is generally considered to involve man's physiological and physical capacity to survive over time (12). Of necessity, diseases commonly appearing with advancing age must be considered under this aspect of aging, as the differentiation between the aging process and pathological process has not yet been clarified. Whether or not anyone has ever really died of old age remains unanswered. Psychological aging refers to an individual's capacity for adapting to his environment (104). Sensory functions and perception, memory and learning, thinking and problem-solving, motor skills, motivation, attitudes and personality are the basic considerations included in this aspect of aging, whereas changes in social circumstances, status and roles, the value systems and interests and activities are those considerations subsumed by the phrase "sociology of aging" (62, 104).

Despite this categorization of the aging process, devised essentially for purposes of organized study and examination, it is in reality impossible to isolate these aspects of aging from one another, so interrelated is their functioning. Much to the chagrin of the researcher, the essence of man's being has proved to be more than just the "sum of his parts," physical (biological), psychological and sociological. But to this writer, there is a beauty in this complexity; for ultimately it is this complex interrelationship of the physical, psychological and social capacities that determines the uniqueness of each individual.

THE PROTOPLASMIC ANOMALY

In an earlier part of this section, Bertolini (11) was cited as having posed the question, "What is the essence of aging?" Instead of an answer to this question, what followed were various descriptions

of the aging process. There was good reason for this seeming omission: the answer is not yet known. The essence of aging is still the enigma that Birren (12) so aptly entitled the "protoplasmic anomaly." He noted that perhaps the most remarkable quality of living matter, i.e., protoplasm, is its ability to renew itself. Thus, if protoplasm is in a continual state of renewal, then how can it "wear itself out" or degenerate? "Shoes, piston rings, tires, etc., don't have self-renewing systems and should wear out, but protoplasm should remain vigorous forever" (12, p. 123). This is the protoplasmic anomaly, the self-synthetic ability of protoplasm and, paradoxically, its senescence. That protoplasm does "wear out" can only mean that the mechanisms for self-renewal are less than perfect or are in some way interfered with, at least after attainment of maturity. Many theories have been proposed over the years as possible explanations for the aging of protoplasm, and some of these will be discussed in the next section. However, not one of these has actually been substantiated as *causing* the aging of protoplasm.

SALIENT CHARACTERISTICS OF AGING

Three changes in life processes are repeatedly observed as people age: (1) decreased metabolic rate, (2) decreased reserve capacity and (3) slowed adaptive response. According to Ford (40) and Shock (90), among others, these are the three primary physiological changes which occur during the aging process. Although they have correctly called the changes "physiological," it should be noted that the three phenomena are also observable in psychological and sociological functioning over time.

The Greeks referred to aging as a progressive dying out of one's "vital fires" (40). Current knowledge indicates they were fairly accurate in this description. Indeed, with the passage of each decade of life, the body's basal metabolic rate (BMR)* decreases approximately 3.5%.

Shock (90) has attributed most of the debilities of old age to tissue loss, i.e., the death and disappearance of body cells. Between the ages of 30 and 90, one's brain weight might decrease as much as one-quarter of a pound or more, the weight of certain muscle groups might decrease as much as 30%, and the number of nephrons** in the kidney might drop by 50%! These decreases are accompanied by similar changes in many other body organs. These weight reductions are basically due to the loss of cells, but because connective tissue replaces at least some of these cells, actual cell loss is probably even greater than the weight loss would suggest. That debilities in functioning are not generally observed until the later years of life is attributable to the body's reserve capacity.

*Basal Metabolic Rate--refers to the amount of energy or number of calories needed to support such basic processes as respiration, body temperature, circulation, etc. of a resting person.

**Nephron--functional and structural unit of the kidney.

This is obviously more or less depleted with passage of time; the extent to which one "ages" is undoubtedly related to the extent by which one's "reserves" are decreased as one grows older.

Ford (40) has designated the slowed adaptive response of older persons to alter their environment or conditions to be "of greatest clinical significance." This slowing is exemplified most readily by comparing older and younger people as they begin to exercise. In essence, the heart rate, cardiac output and pulmonary ventilation of the older person and younger person both increase, but in the older person the increase is more gradual and probably less marked even at its extreme point. The older person incurs a large oxygen debt requiring him to limit the extent of his exercise in comparison with the younger person, and also requiring a longer recovery period. This slowed response is not limited to exercising capacity, but is manifested eventually in all the body's adjustments, to heat and cold, sleeping and waking, dark and light, alertness and relaxation, to name a few. The loss of such physiological flexibility is probably the leading cause of death among animal species, as the aging competitor begins to lose the race for prey or from predators. For human beings, the penalties for loss of speed and flexibility are somewhat different but still critical. Examples of such penalties are decreased ability to escape injury, increased susceptibility to toxic effects of drugs and/or disease agents and increased need for prolonged recovery periods following stress such as exercise, illness and over indulgences.

Strehler (93) has summarized some of the salient aging changes as follows:

1. Intracellular substances called "age pigment" accumulate in substantial amounts with age.

2. Autoimmune reactions increase with age.

3. The body's predominant protein, collagen, undergoes a molecular change called "cross-linking" and loses some of its flexibility and solubility.

4. Human cells seem limited to approximately 50 divisions.

5. Body organs lose weight, probably due to cell loss.

6. Muscular strength decreases, probably partially the result of cell loss.

7. The number of nerve fibers and the speed of transmission of nerve impulses decreases.

GROWING OLD IN AMERICA TODAY

The process of aging involves more than just physical changes. Many of the important changes one experiences with advancing age

occur in the psychosocial aspect of life and may indeed affect one's capacity for living as much as do the physical changes. A psalmist wrote in the Old Testament:

> The days of our years are threescore and ten
> And if by reason strength they be fourscore years,
> Yet is their strength, labour and sorrow,
> For soon it is cut off, and we fly away.
>
> Psalm 90:10

How similar to life as we experience it today! Not only do Americans live approximately "threescore and ten" years; but in living that long, life for many, if not most Americans, unfortunately seems to result in "labour and sorrow." Bennet (9, p. 27) has described becoming old in a rapidly changing society, as something "to be avoided because it brings isolation and segregation," something "reserved for social undesirables of all kinds," whereas, in traditional societies aging may mean "a gradually expanding role in the exercise of wisdom and judgement, an honored position." America is and has been, practically since the landing of the Pilgrims, a rapidly changing society. Perhaps this fact more than white hair, increased weight and declining strength and reflexes has been responsible for the very negative attitude of Americans toward passing that 30-year mark, let alone ever advancing to the point of being labeled "retired." Rosenfelt (83, p. 37) has aptly described this in her essay "The Elderly Mystique," which she defined as "a core of ideas and attitudes, explicit or not, held by an in-group [the young], with respect to a particular concept--in the present instance, old age." She concurred with Bennet that the American attitude toward aging and the aged was a "psychosocial reflection of rapidly accelerated conditions of technological development." The following is the essence of Rosenfelt's portrayal of the American elderly:

> Health and vigor, it is assumed, are gone forever. The senses have lost their acuity. The memory is kaput. Education and new learning are out of the question, as one expects to lose his mental faculties with age. Adventure and creativity are for the young and courageous. . . . As for the pleasures of sexual relationships--the very thought of the old person in such a context brings smiles. . . .
>
> The old person . . . as a worker has become a liability, he has become a person out of date in training. His proneness to disabling illness, his irritability, lowered efficiency and arrogant manner all mitigate against his being hired. . . .
>
> Let him [older person] brace himself for isolation and rejection. Disengagement is a two way process and more the second way than the first, meaning that external forces are more cogent to the outcome than the individual's voluntary

> relinquishment of roles that bind him to on going society. Worse than isolation is the mental ill health that follows it. . . . The nadir of the process is, of course, institutionalization of the aged, a practical method of storage until death.
>
> Nothing is to be expected from the children. They have their own lives to lead. . . .
>
> The participant in the elderly mystique knows society finds it hard to accept, let alone forgive, his existence. The old person expects derogation in explicit terms. . . .
>
> There is no hope in old age, and those who grow old are quite hopeless. That, in essence, is the elderly mystique (83, pp. 39-41).

Perhaps one of the major questions confronting society today is, Can we afford to continue allowing the conditions and attitudes portrayed in Rosenfelt's "elderly mystique" to prevail? Benjamin Franklin was over 80 when he wrote his autobiography; Stradivarius was still making violins in his 90's; Grandma Moses didn't even start painting until her 79th year; Michelangelo completed his painting of the Sistine Chapel when he was over 80 (23). Somehow these now famous people avoided, ignored or overcame the negative feelings associated with aging today. Perhaps the most critical factor in the apparently successful aging of these individuals was that they had something important to do--a reason for living. Hamlin (43) has proposed a "utility theory of old age." His hypothesis is that if an aging person "realizes utility" in his years, even beyond 70, he will retain his competence and perhaps even live longer. A modern example, perhaps, of this proposition is Dr. Tolber Hill from Athens, Illinois, a town of about 1000 people (36). He recently retired from his medical practice at the age of 100. He had wanted to retire in 1955, but the town was unable to attract another doctor, so Dr. Hill stayed on. Certainly other possible examples of Hamlin's proposal are not so remotely located as Dr. Hill, but daily serve society from the Supreme Court bench, the Congress and the Vatican. How many other Franklins, Hills and Pe[illegible]rious X's are there and have there been? That will never be fully known; nor will it be known how many there *could* be, were it not for the prevailing attitude toward aging and its psychologically and sociologically detrimental consequences.

Rosenfelt ended her "mystique" essay with this challenge: "The task of society would appear to consist of providing *universal* opportunity at every stage of life for the optimal growth and development of the individual. If this were so, the elderly mystique would find few subscribers" (83, p. 43). It would seem that one of the first steps in effecting such opportunity must be the education of society regarding the aging process, i.e., what physical and psychosocial changes attend advancing age; what negative

changes can be prevented or at least, minimized; and what and how can positive changes be maximized. Timiras (97) has stated that the goal of gerontology is "to add years to life and life to years." If education does its job, perhaps this goal will actually see fruition.

PART II

PHYSICAL ASPECTS OF AGING

HOW DOES THE BODY CHANGE WITH AGE?

What physical changes can one expect as one grows older? This may seem like a fairly simple question to answer. Who doesn't know that hair turns gray; wrinkles and bulges appear; glasses bedeck the nose; the gait slows and energy wanes; hearing requires a hand cupped behind the ear; sexuality diminishes and "dies"; the mind grows forgetful and confused; and those awful words, heart attack, cancer, arthritis, diabetes and yes, death, become realities. This is typical of the way many people view the aging process and then only when forced! Such a discouraging forecast is hardly something people wish to think about as happening to them.

There are several problems, however, with this commonly accepted view of aging. For one, it is superficial and incomplete--there is more to aging than meets the eye! In fact, the gross aging changes one *sees* are really only "symptoms" of the multitude of alterations and/or losses that have been occurring within cells, organs and internal body systems since one's 20's or even before that! Although these invisible changes are little known to most people, they are perhaps the most important. Secondly, some of the observations offered in the above "typical view" of aging are simply not accurate or, at the very least, not accurate for many. Myths abound about the aging process and its effects on one's looks and life. This is perhaps one of the most unfortunate aspects of aging, for one's beliefs, whether based on fact or fancy, can too easily become self-fulfilling prophecies! In addition, the older one becomes, the more evident is one's individuality, and thus, the more inappropriate gross generalizations of change become for any one person. To what degree and at what age in life one experiences aging and/or pathological changes in functioning and/or appearance is a highly individual matter. Birren (12) has listed the following factors as relevant to individual differences in longevity and aging: biological background (health, heredity and sex); education (level attained and type); occupation (type, work setting, length of time); marital status and family life; ethnic group (food customs, life style, nativity); geographic location (place of birth, childhood, adult years); housing (household composition and place); recreation (number and type of activities); religion (beliefs and attitudes) and social class (income and social roles). Considering the astronomical possible combinations of these factors, one can only conclude that as one grows older, one's uniqueness becomes only more obvious--a fact unfortunately not yet recognized by much of society.

So what does happen to one physically as he grows older? Summarily one experiences a decreased metabolic rate, a reduction in reserve capacity and a slowed response capability. Essentially then, as one ages, the rate at which one's bodily functions proceed decreases; one's ability to

respond to stresses above and beyond "normal" everyday activity decreases and the rapidity of one's responses to all stimuli gradually decreases.

Aging changes can be observed from several levels: (1) the total body, (2) tissues and organ systems and (3) cells. The number and complexity of these changes is too great to be considered in depth in this monograph; only a summary of aging changes at each level will be offered here. It is hoped that the reader will consult the references cited for greater detail.

AGING HUMAN CELLS

Beginning with the smallest basic unit of the body, the cell, numerous aging changes have been reported, many of which would seem to contribute directly to eventual cell death. And indeed, a gradual but continual loss of cells is a major characteristic of the aging process (reduced reserve capacity). For purposes of further discussion, it is important to digress a moment and note that body cells are classified as labile, stable and permanent according to decreasing regenerative capacity. Labile cells, e.g., blood cells and mucosal cells, have a high regenerative capacity and new cells continually replace old "worn out" ones. Stable cells, e.g., from the liver, kidney, endocrine and exocrine glands, do not regenerate so rapidly, but have a turnover rate somewhere between the labile and permanent cells. Permanent cells are unable to divide to regenerate themselves. This is the critical point. These permanent cells are the body's most specialized, such as nerve cells, sensory cells and muscle cells (which of course include heart cells). Notable age changes are more apparent in permanent cells and are, in sum, functionally degenerative. Some of these changes include: (1) change in the amount (usually reported as decreased) and form of chromatin material (DNA) in the nucleus; (2) decrease and alteration in shape of the mitochondria (the cell's energy factories); (3) disruptions within the endoplasmic reticulum (the cell's internal highway system) and alterations of its ribosomal elements (where body proteins, e.g., enzymes, are structured); (4) alterations and disruptions in cell membrane (lipoprotein material) permeability; (5) accumulation in the cytoplasm of inert pigments (lipofuscin), ceroid (a type of lipofuscin) and melanin pigments--the first two seemingly composed of cellular lipoprotein material); (6) depletion of glycogen (cell's energy stores) and (7) destruction of lysosomes (cytoplasmic sacs of hydrolytic enzymes, apparently responsible for processing cell wastes) (11, 12, 15, 47, 89, 97). Although the specific meaning of each of these changes has not been fully elucidated, the obvious result is impairment of the functional integrity of the cell. The cell's "software" or program seems to change, its "hardware" or machinery seems to break down and its fuel supply and waste disposal systems seem to become less efficient. Thus, the cell's "assembly line," which at least must produce the necessary components for self-repair and maintenance and, at most, must contribute necessary materials to cells of other systems, has to struggle with an increasing number of erroneous instructions, faulty machinery and fuel and waste disposal problems. This can only result in the increasing production of defective products unusable, wholly or in part, by cells and thus, eventual cell death.

For tissue with regenerative capability, the death of a cell is not so critical; it can be replaced. For tissue without such capability, cell death can only mean decreased functional ability. However, even regenerative capacity seems to decrease as age increases and is subject at all times to variations in the state of nutrition (which usually becomes less than optimal with advancing years). Hayflick's work (49,50) with human cell cultures *in vitro* (in this case, fibroblasts) has suggested that the regenerative capacity of human cells is limited to approximately 50 cell divisions, after which the cells die or take on characteristics of malignancy. Cultures of aged cells, he found, underwent fewer multiplications than cultures of embryonic cells; and that shorter-lived vertebrates, e.g., chickens and rats, had less capacity for cell division than humans cells, averaging fifteen doublings in cell cultures. After examining and discarding a number of possible reasons for such a regenerative limitation, Hayflick concluded that human cells either eventually developed inaccuracies in their "program" of instructions and/or gradually lost their capacity for repair. It has also been suggested, that either or both of these situations could be at least accelerated, if not initiated, by an inadequate or inappropriate nutrient supply.

THE AGING OF HUMAN TISSUE AND ORGAN SYSTEMS

The second level at which aging changes can be observed is that of tissues and organ systems. It seems appropriate to begin this section by considering the body's connective tissue, for changes in connective tissue have been called the most characteristic and most observable signs of aging (96). They are deemed largely responsible for the inflexibility, wrinkled skin, bent backs and cracking joints one seems to develop with advancing years.

Connective tissue is ubiquitous in the human body. It connects and separates one organ from another, one tissue from another; it provides padding material beneath the skin, between the muscles and along nerves and blood vessels. Obviously then, most of the metabolic substances passing to and from the working cells of a tissue or organ must move through the interstitial fluid of connective tissue.

Connective tissue contains three types of fibrous material: (1) collagen, (2) elastin and (3) reticulin, the latter two apparently being variations of the first. Collagen, a tough, anelastic fiber is the most abundant of the three types. According to Bertolini, collagen accounts for 80-90% of the protein substance in tendon, 90-95% of all organic matter in bone, 55-75% of the protein in skin and 1-3% of organic matter in muscle (11). Elastin differs from its "parent" collagen in being obviously elastic, but only one-tenth as resistant to breaking under tension. These fibers occur as isolated branching threads amidst collagen fibers, especially in the skin and in the connective tissue encircling the great arteries. Thus the skin and blood vessels have an elastic quality, at least in youth. Reticulin fibers, nearly like collagen in composition, but much more delicate, are components of that connective tissue in immediate contact with the various body organs, liver, kidney etc. So closely is it "connected"

with muscle tissue that it seems actually to contribute to and complete the sarcalemma (the delicate sheath enveloping a muscle fiber). Collagen and its variations share an intimate relationship with the body's vital organs and structures. Surely detrimental changes in collagen with age would present potential problems in the functioning of these organs.

With aging, the overall amount of collagen increases (although the form, elastin, decreases) and becomes more rigid and, in the case of elastin, less elastic. The fibers seem to toughen and change somewhat in composition, becoming less soluble. These changes are apparently the result of a process called cross-linking. (78, 89, 96). This process essentially involves the switching about of chemical bonds responsible for holding together the three poly-peptide strands (essentially, strings of amino acids) that form a collagen fiber. A schematic view of cross-linking is presented in Figure 1. The possible causes of this cross-linking will be discussed later; suffice it to say here that as a result of this cross-linking process, connective tissue, wherever it is, tends to become rigid, inelastic, tough and somewhat insoluble to body metabolites normally passing through it. Thus, the skin once stretched, loses its ability to return to its "old form" should weight be lost, and the expansion and contraction of blood vessels surrounded by connective tissue is impeded. In essence, the cross-linking of the ubiquitous and abundant collagen most surely contributes to the less efficient functioning (slowed response capacity) of the body's organs and tissues and the eventual demise of some of its cells (reduced reserves).

In addition to these detrimental connective tissue changes, a general physiological decline has been observed throughout the body's organ systems as age increases. Shock (90) has provided percentage estimates of functions or tissues remaining in the average 75-year-old man as compared with the average 30-year-old man (see Table 1).

Functional or tissue declines as observed in each organ system can be largely attributed to one or more of the three basic aging changes: loss of cells, slowed response times and/or decreased metabolic rate. Within the central nervous system, for example, the brain apparently loses cells daily, a loss beginning in childhood. Busse (20) has estimated that in the latter half of life, as many as several thousand neurons may die each day. This thought might be alarming to those unaware of the body's natural reserve supply of critical cells. There is little or no decline in mental capacity with age (as will be discussed more completely in the next section), but rather only a slowing of mental response time, which should attest to the tremendous neuronal reserve supply. In fact, Busse has estimated that the brain of the young adult contains some 12 million neurons.

Not surprisingly, this continual cell loss results in a loss of brain weight, the loss ranging from 150 to 200 grams between the ages of 20 and 80 (4). However, since this reduced cell volume is compensated by increases in cerebral spinal fluid and neuroglial cells (nonnervous supporting cells of the nervous system), the actual loss of neurons is probably even greater than gross weight loss indicates. (97)

TABLE 1

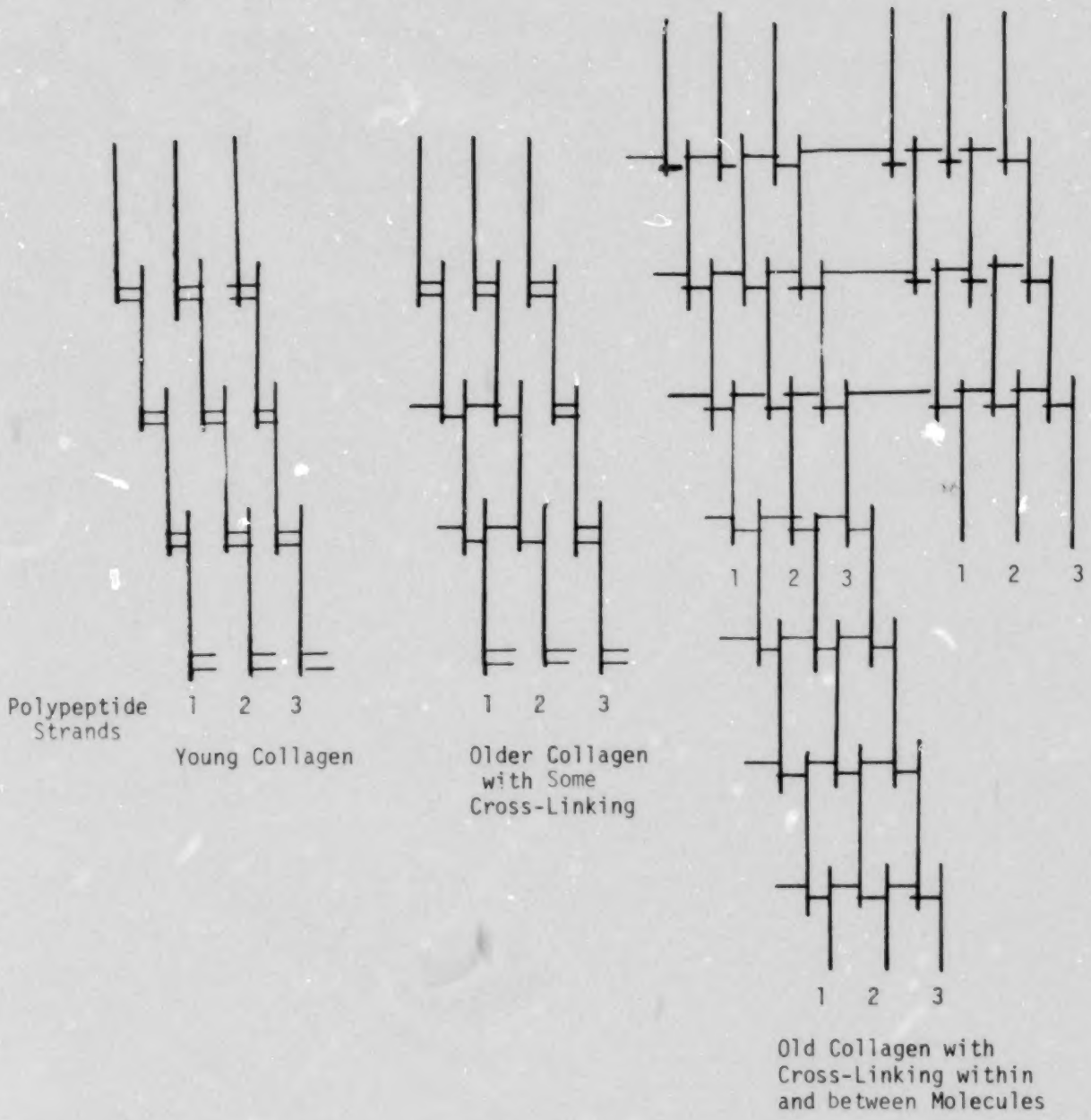
FUNCTIONS OR TISSUES REMAINING IN THE AVERAGE 75-YEAR-OLD MAN

Function or Tissue	% Remaining in 75-Year-Old Man (30-Year-Old Man = 100%)
Brain Weight	56
Number of Nerve Trunk Fibers	63
Nerve Conduction Velocity	90
Blood Flow to Brain	80
Cardiac Output (At Rest)	70
Number of Glomeruli in Kidney	56
Glomerular Filtration Rate	69
Kidney Plasma Flow	50
Maximum Oxygen Uptake (During Exercise)	40
Maximum Ventilation Volume (During Exercise)	53
Maximum Breathing Capacity (Voluntary)	43
Vital Capacity	56
Maximum Work Rate	70
Maximum Work Rate for Short Burst	40
Hand Grip Strength	55
Number of Taste Buds	36
Basal Metabolic Rate	84
Less Adrenal Activity	?
Less Gonadal Activity	?

(N.B. Estimates for females are not yet available.)

FIGURE 1

THE CROSS-LINKING OF COLLAGEN



Adapted from "The Enigma of Human Aging," Chem. & Eng. News 40: 138-146, February 12, 1962. Used with permission from the editor, Chem. & Eng. News.

Brain cells are not the only cells lost from the nervous system, however: loss of sensory receptors and/or increases in their sensitivity threshold also occurs with age. As estimated by Shock, only about 35% of the taste buds remain by age 75, which undoubtedly accounts for food "not tasting like it used to" and, to some degree, the lack of desire to eat often expressed by older people. The threshold of cutaneous sensitivity increases with age, apparently owing largely to the changes in the collagen and elastic tissues surrounding receptors (12, 97). One simply doesn't feel as good as one used to! The lens of the eye gradually loses its accommodation ability (elasticity) in near-point vision (presbyopia); and it becomes increasingly opaque, yellowish and less permeable to light (21, 97). In fact, Charles (28) has suggested that each 13-year increase in age requires a doubled light intensity for proper vision. Field of vision narrows several degrees between middle and old age, and visual acuity drops (30, 28). The auditory canal atrophies and narrows, and auditory neurons decrease in number, apparently resulting in loss of high frequency hearing, especially in men (11, 28). However, it must be noted that it has been impossible, to date, to pinpoint hearing loss due to aging alone, as otosclerosis and environmental noise also affect hearing (11, 97). These auditory and visual changes actually begin in the early 20's although they are not usually noticeable until the 50's. It also appears that the number of large afferent and efferent nerve fibers (the fast transmitters) decreases with age, and synaptic delays of 100 milliseconds have also been reported (12, 97). Certainly the combined effect of all of these changes could only be a slowed response time and reduced adaptive capacity. What is truly remarkable is the minimal degree to which this slowing is manifested by most older people.

The saying that man is as old as his arteries reflects the view that sufficient cerebral blood flow is critical to proper brain function. Birren (13), in his classic studies of healthy and diseased aged, has reported that the cerebral blood flow of older men demonstrating no or only slight evidence of arteriosclerosis was within the normal "young" range, whereas in older men with evident arteriosclerosis, cerebral blood flow was about 16% below the young range. Importantly, those men experiencing reduced cerebral blood flow did not perform as well on tests of mental function as those men with an apparently normal cerebral blood flow. The fact that senility seems in part due to brain hypoxia makes Birren's finding very significant. Apparently for these older men, a pathological process rather than the aging process was more responsible for decreasing cerebral blood flow and thus limiting the oxygen supply. Perhaps related to insufficient cerebral blood flow and subsequent hypoxia is the primary EEG (electroencephalogram) change observed in older persons: a slowing of the alpha-wave frequency (13, 15, 97). Such slowing of the alpha wave has been associated with a decline in intellectual functioning. However, it has not been clearly determined whether such alpha wave changes result from aging alone, i.e., without pathology, although there have been hints of this (15, 97).

One last note regarding aging changes of the central nervous system is directed toward the accumulation of "aging pigments"

(lipofuscin pigments), especially in cells of the hypothalamus and hippocampus and sympathetic and vagal ganglia. The presence of these pigments increases linearly with age and thus has been called one of the most reliable indices of chronological age (12, 97). The origin of these pigments is not clearly known, but it has been suggested that their formation is caused or influenced by such extrinsic factors as hypoxia, Vitamin E deficiency, excess unsaturated fat, drugs and irradiation and by intrinsic factors which are basically genetic. These pigments seem to be nonfunctional and insoluble substances; and although their increasing presence has been associated with degeneration of cells, in this case nerve cells, it really is not known whether this degeneration is caused by their excessive accumulation or if the pigments have formed as a result of cell deterioration. It is interesting to note though that the components of lipofuscin pigments are basically lipoproteins and acid hydrolysis-resistant residue--in more meaningful terms, perhaps, bits and pieces of cellular (lipoprotein) materials and enzymes from lysosomes and mitochondria (94, 97).

The ability to do work or exercise is especially dependent upon the integrity of the muscular, cardiovascular, respiratory and renal systems. According to Shock's previously cited summary of functional decline, work capacity decreases markedly with age, from 30-70%, depending upon the severity of the work. This is understandable upon examination of the aging changes that develop in the musculature, heart and blood vessels, lungs and kidneys.

From the peak of ability which occurs between 20 and 30 years of age, there is a gradual loss of muscular strength and tonus (11, 97). These declines are explained in part by the loss of muscle cells (permanent cells) and their replacement by connective tissue (collagen and fat), which lacks contractile capability. All muscles demonstrate such atrophy. In addition, the "wear and tear" lipofuscin pigments steadily accumulate in the sarcoplasm of muscle cells, especially those of the heart (11). However, according to Dock (35), people who continue vigorous physical activity into old age and those with valvular disease or high blood pressure experience a lesser degree of heart atrophy and, in fact, their hearts may even hypertrophy. Also, he noted that the percentage of age pigments appears to be lower in hypertrophic hearts than in normal ones.

In addition to these atrophic muscle changes, the arteries are afflicted with a gradual deposition of fat on their smooth muscle walls. This process, known as atherosclerosis, is usually considered to be pathological; but Timiras (97, p. 477) has noted that its occurrence is so universal in almost all animal species and so progressive with advancing age that "it is generally considered to be an inevitable manifestation of aging. . . ." The eventual results of this process are narrowed, less elastic vessels through which the flow of blood becomes increasingly difficult.

The net effect of these cardiovascular changes seems to be a reduced cardiac output (the amount of blood pumped per unit of time)

and blood flow. Shock (90) estimated that the brain and kidney, for example, of a 75-year-old man receives 80% and 42%, respectively, as much blood as those of a 30-year-old man. Exercise, of course, exaggerates these inadequacies. Thus, for any type of muscular activity, cardiac output becomes gradually less adequate with age. Consequently, the circulatory demands of exercising muscles are not sufficiently met and working capacity is limited. For work actually performed under these insufficient conditions, the older person requires a longer recovery period than the younger person; heart rate, blood pressure and respiration remain elevated longer after exercise (or stress) in the old than in the young.

The aging of the respiratory system parallels that of the cardiovascular system in terms of increasing inadequacy to support the oxygen demands of exercise. The respiratory muscles exhibit the expected atrophy and decreased strength; the rib cage itself becomes progressively rigid (11, 15, 99). In association with these declines in mechanical efficiency, vital capacity (the amount of air that can be forcibly expired from the lungs) diminishes, as does maximum breathing capacity (the amount of air that can be moved through the lungs in 15 seconds) (90, 97). Put simply, the older person cannot breathe as fast and hard as the younger person.

Within the lung itself, the alveoli (air sacs) progressively deteriorate, gradually resulting in old age in atrophic emphysema of greater or lesser degree (11). Of course, in smokers this development is greatly accelerated. Blood flow through the lungs decreases with age (38) and the amount of oxygen the blood takes up from the lungs and transports to the tissues falls substantially. For example, the blood of a 20-year-old man takes up, on the average, approximately four liters of oxygen per minute, but at age 75 this rate has fallen to about 1.5 liters per minute (90, 97).

Because working muscles pour acid waste products into the blood, the functioning of the kidney also becomes a potentially limiting factor to exercise. The kidney fares no better than other organs as age increases. The kidney's million or so nephrons (basic functional units of the kidney) progressively disappear with advancing age, being replaced by fat and connective tissue (11). Blood flow through the kidney declines markedly with age; in addition, the waste filtration rate and maximum excretory capacity, as well as glucose resorption, decreases to approximately the same extent (90). Nevertheless, the kidneys can still do their job rather satisfactorily; it just takes longer. Thus the aging person's ability to do work is further curtailed by kidneys that can't cleanse the blood fast enough to prevent increased blood acidity from incapacitating working muscles.

The body's reduced capacity to adapt or respond can even be observed in the seemingly minor stresses of life. For example, although the average blood glucose level remains fairly constant throughout life, the rate at which extra glucose is cleared from blood decreases significantly with age (90). Research suggests that aging changes in

cell membrane permeability may reduce the effectiveness of insulin in facilitating the passage of glucose from the blood into cells (11). Another example of reduced response capability is the declining ability of the sebaceous (oil-producing) glands to supply sufficient amounts of oil to prevent drying of the skin (24, 54). Also, between the ages of 30 and 60, the secretion of digestive juices steadily diminishes in response to a standard meal. Specifically, the more prominent decreases are of ptyalin in saliva, hydrochloric acid and pepsin in gastric juice and proteolytic enzymes in pancreatic juice (97). And finally, the gradual demineralization of bone with advancing age, especially notable in women, results in the loss of volume and thickness in compact bone, and obviously a loss in mechanical strength. This process is called osteoporosis. Skeletal fragility can become so severe as a result of this process that vertebrae may partially disintegrate causing the spine to bend or "stoop" and long bones to fracture easily or simply snap under the body's weight (11).

One last but most important organ system will be discussed: the reproductive system. The importance of this system as considered here is not related to its reproductive functions as such, but rather to its role in providing a emotional and physical satisfaction throughout adult life. Reduction or cessation of sexual activity may, of course, be one's rational choice; but because the attitude of society toward sex after 50, 60 or even 70 seems to be based more on myth and fear than fact, this seems doubtful. Indeed, there is seldom any appropriate physiological reason for abandoning the sexual aspect of life as one ages.

Undoubtedly, it will be news to no one that ovarian function ceases in females generally between the ages of 45 and 55. Menopause, as it is known, represents the loss of ability to produce viable ova and the gradual atrophy of the ovary, through loss of active ovarian cells and its subsequent replacement by connective tissue (11). With atrophy of the ovary, the secretion of steroid hormones, especially estrogen, diminishes. However, because progesterone, the precursor of all steroids synthesized in the body, is also produced in the adrenal cortices, at least some hormonal secretion persists for a long time after menopause (11). In addition to these changes, the breasts tend to become flaccid and drooping after menopause, due to the decreased estrogen supply and the replacement of lost fat and gland tissue by connective tissue. The vaginal wall gradually thins, and decreasing production of lubricants may result in occasional genital irritation.

The physical symptoms of menopause, from the the famous hot flashes to breast changes, can often be alleviated, to some degree, by estrogen therapy (53, 63). However, since endocrine starvation has only an indirect influence on female sexual capacity or performance (63), emotional distress at this prospect is unwarranted. Masters and Johnson emphasize that "the psyche plays a part, at least equal to, if not greater than, that of an unbalanced endocrine system in determining the sex drive of women during the post menopausal period of their lives" (63, p. 269-279). In fact they note that elevation of sexual responsiveness rarely results directly from the administration of estrogen. In their considered opinion, the most critical factors necessary for maintained sexual

capacity and performance throughout the female's life are: (1) the opportunity for sexual expression and (2) satisfactory premenopausal sexual experience. In short, advancing age itself imposes no limit to female sexuality.

For males, the limitations imposed by age on sexual capacity and performance are essentially no different than those for women; however the aging process proceeds somewhat differently. From approximately 25 to 30 years of age on, there is a gradual decrease in the size and weight of the testicles reflecting loss of cells and replacement by connective tissue. There is also a gradual decrease in sperm production and the ejaculate tends to be less abundant (11), although spermatogenic activity rarely ceases. Timiras (97) reports that the number of sperm in the ejaculate of men in their 60's is approximately 30% less than that of young men and that in the eighth and ninth decades of life this decreases about another 20%. Testosterone production, as would be expected, follows the gradual decline of active testicular cells, although adrenal production of testosterone (an estimated 10%) changes very little (11, 97). The prostate gland may actually hypertrophy with age, possibly as the result of decreasing testosterone dominance over estrogen, which apparently can stimulate such growth (97). According to Reuben, this development may eventually create health problems for as many as one out of every three males over 30 (81).

In terms of male sexual capacity throughout life, these physical/physiological changes seem to have little effect other than slowing the reaction patterns of erection, mounting and ejaculation, easily achieved by younger men. And although penile erection is more slowly achieved, once accomplished it is maintained for a longer period than is characteristic of young men (97).

Thus males experiences no single climactic episode as do women. Their ability to father children extends well into the later decades of life, unlike the female reproductive ability; and yet the incidence of sexual inadequacy increases markedly after 50 years of age (63). Why does this happen, when apparently physical capacities remain decently adequate? According to Masters and Johnson, "the most important factor in the maintenance of effective sexuality in the aging male is consistency of active sexual expression" (63, p. 274). The factors most often interrupting such consistency, they suggest, are: (1) monotony in one's sexual relationship (partner has become unattractive, boring etc.); (2) preoccupation with career; (3) mental or physical fatigue (mental fatigue being the greater deterrent); (4) overindulgence in food or drink, especially alcohol; (5) physical or mental infirmity in the male or spouse and (6) fear of failure in sexual performance.

In summary then, the maintenance of sexual performance in both females and males, as age increases, seems far more dependent upon social and psychological factors than upon the effects of physiological and physical changes.

Earlier in this section on aging changes, three basic characteristics of aging were identified: decreased metabolic rate, reduced reserve

capacity and slowed response capability. With examination of the aging process as it occurs in the various tissues and organs of the body, the pervasive nature of these three basic phenomena should be evident. In each organ system discussed, there was a progressive loss of specialized (permanent) cells as age increased, followed by replacement with non-specialized connective tissue, incapable of performing the special functions of the lost cells. The overall effect of this progressive cell loss is a gradual decline in the rate of total body functioning and a gradual depletion of the body's reserve supply of cells. Additionally, the incapacity of the replacement tissue to perform the functions of the original cells gradually weakens the system and slows the body's response capability.

AGING AND DISEASE

Birren (13, p. 2) has described aging as a "pattern of late life change ultimately distinguishable from disease." These "late life changes" are for the most part unfavorable and presumably lead to eventual death. It may sound strange to say "presumably lead to death," but the question of what is a natural death remains unanswered. What is aging and what is pathology is really not so easy to distinguish; as we observed in the discussion of the cardiovascular system, Timiras suggests that atherosclerotic developments be considered part of the aging process itself. It is conceivable that such a case could be made that many if not most of the so-called chronic diseases such as diabetes, arthritis, hypertension etc., are actually manifestations of aging. It is beyond the scope of this monograph to consider this question in depth, but the correlation between advancing age and the occurrence of certain "diseases" warrants at least identification of those diseases most likely to occur with advancing age.

According to the National Center for Health Statistics (51), diseases of the heart, cancer and cerebrovascular disease are the major causes of death among older Americans, accounting for 70% of the 1.7 million deaths of people over 45 (see Fig. 2). Heart disease alone is responsible for the 40% of these deaths. After these, other major pathological causes of death in the later years of life are cirrhosis of the liver, influenza and pneumonia, arteriosclerosis, diabetes mellitus, bronchitis and emphysema and kidney infections (see Table 2). It is interesting to note here that deaths due to atherosclerotic heart disease, hypertension and respiratory infections increase progressively throughout life; whereas diseases such as cancer, diabetes and cirrhosis of the liver decline as causes of death among the *very* old (56).

In terms of chronic ailments plaguing aging Americans, but not necessarily resulting in death, heart disease again leads the list, followed by hypertension, diabetes and arthritis. Each occurs more frequently as aging progresses, and all are more common among women than among men. Both heart disease and hypertension are more prevalent among black Americans than among white (see Fig. 3) (51).

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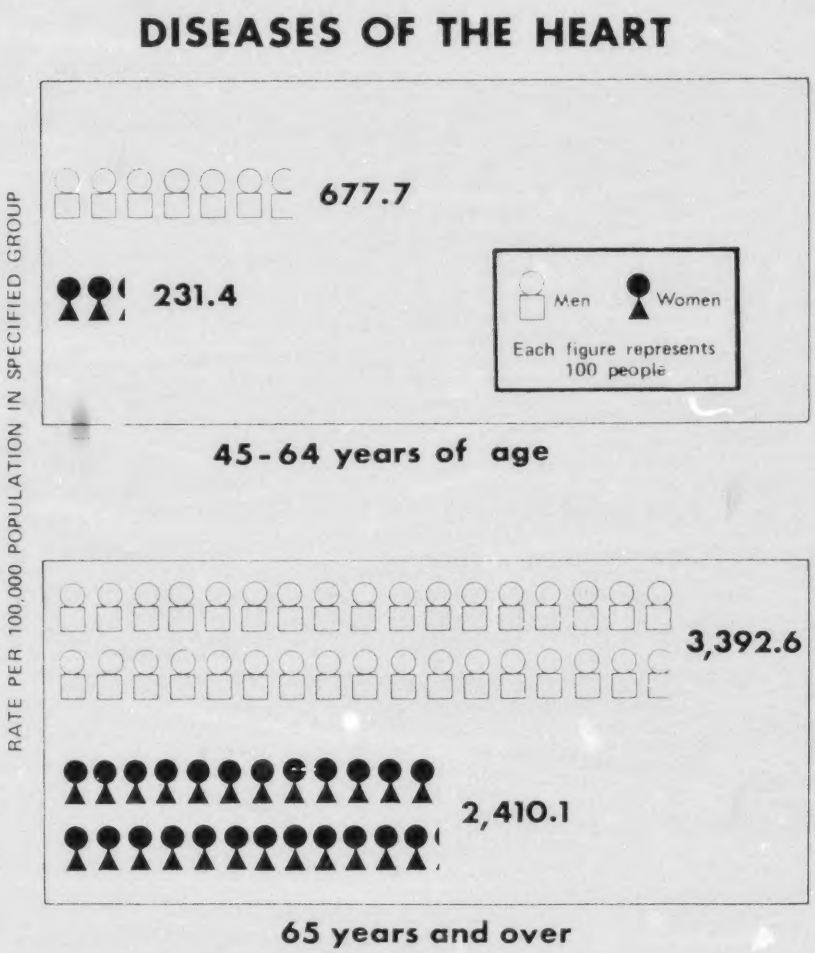
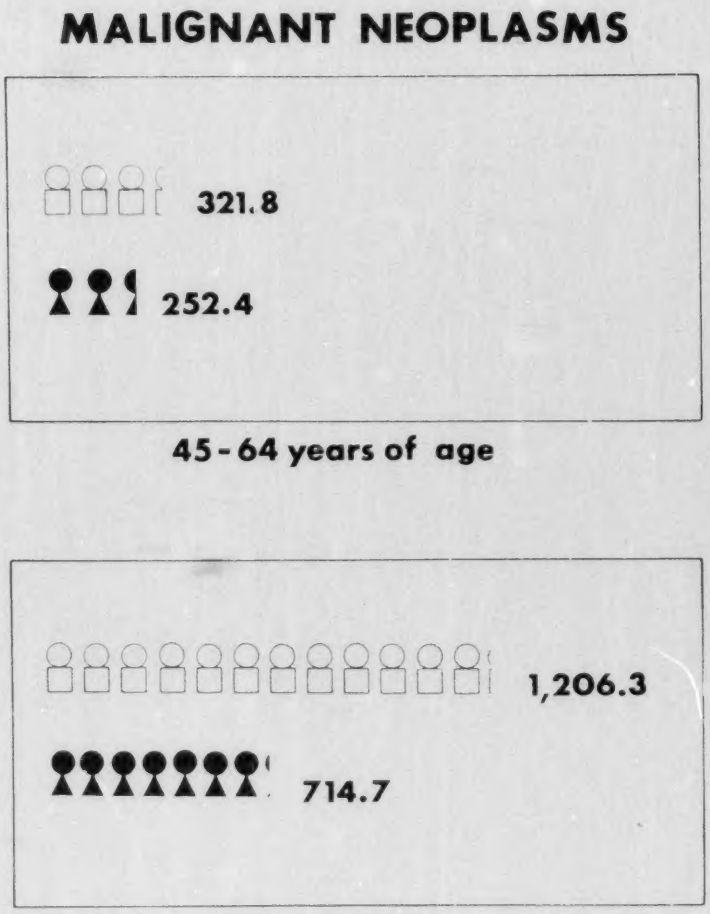
FIGURE 2

DEATH RATES FOR THE THREE LEADING CAUSES OF DEATH AT AGES 45-64 AND 65 AND OVER, BY SEX: UNITED STATES, 1968



From: Health in the Later Years of Life. DHEW Pub. # (HRA) 74-1207. Washington, D.C. 1971

FIGURE 2a



RATE PER 100,000 POPULATION IN SPECIFIED GROUP

FIGURE 2b

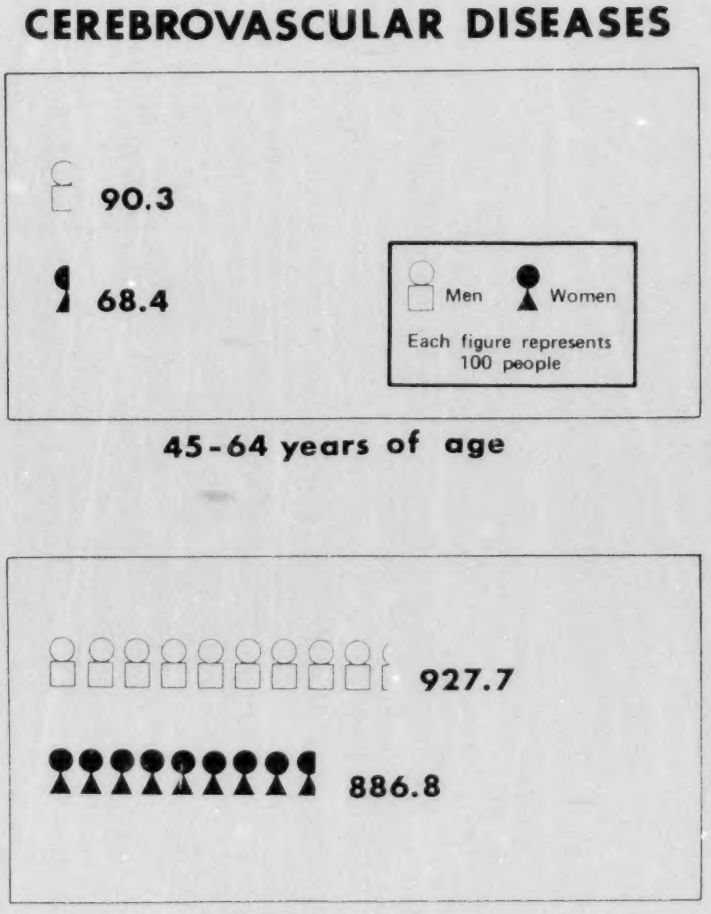


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FIGURE 2c

PREVALENCE OF HEART DISEASE AT AGES 45-64 AND 65-79, BY SEX AND RACE: UNITED STATES, 1960-62

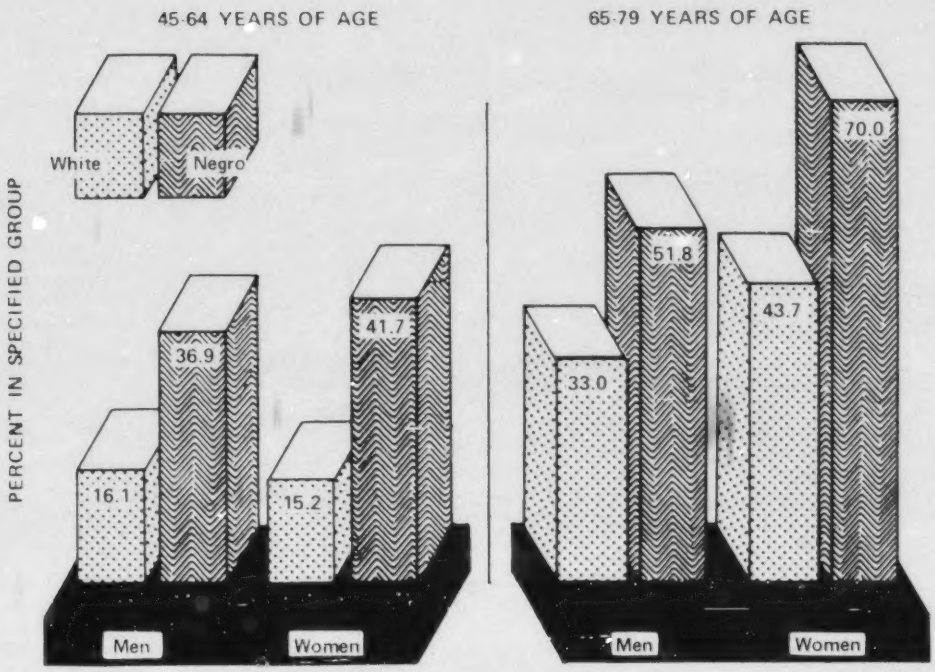

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TABLE 2

LEADING CAUSES OF DEATH AT AGES 45-64 AND 65 AND OVER, BY SEX: UNITED STATES, 1968

Rank	Cause of death[1]	Number	Rate per 100,000 population in specified group
	45-64 YEARS OF AGE		
	Both sexes		
	All causes	479,038	1,176.0
1	Diseases of heart	181,446	445.4
2	Malignant neoplasms	116,385	285.7
3	Cerebrovascular diseases	32,145	78.9
4	Accidents	23,896	58.7
	Motor vehicle accidents	11,031	27.1
	All other accidents	12,865	31.6
5	Cirrhosis of liver	16,714	41.0
6	Influenza and pneumonia	12,107	29.7
7	Diabetes mellitus	9,982	24.5
8	Bronchitis, emphysema, and asthma	9,856	24.2
9	Suicide	8,374	20.6
10	Homicide	3,190	7.8
	All other causes	64,943	159.4
	Men		
	All causes	309,995	1,586.8
1	Diseases of heart	132,393	677.7
2	Malignant neoplasms	62,876	321.8
3	Cerebrovascular diseases	17,648	90.3
4	Accidents	17,463	89.4
	Motor vehicle accidents	7,802	39.9
	All other accidents	9,661	49.5
5	Cirrhosis of liver	11,039	56.5
6	Influenza and pneumonia	7,849	40.2
7	Bronchitis, emphysema, and asthma	7,593	38.9
8	Suicide	5,893	30.2
9	Diabetes mellitus	4,747	24.3
10	Homicide	2,569	13.2
	All other causes	39,925	204.4
	Women		
	All causes	169,043	797.3
1	Malignant neoplasms	53,509	252.4
2	Diseases of heart	49,053	231.4
3	Cerebrovascular diseases	14,497	68.4
4	Accidents	6,433	30.3
	Motor vehicle accidents	3,229	15.2
	All other accidents	3,204	15.1
5	Cirrhosis of liver	5,675	26.8
6	Diabetes mellitus	5,235	24.7
7	Influenza and pneumonia	4,258	20.1
8	Suicide	2,481	11.7
9	Bronchitis, emphysema, and asthma	2,263	10.7
10	Infections of kidney	1,234	5.8
	All other causes	24,405	115.1

[1]Causes are categorized according to the Eighth Revision, International Classification of Diseases, Adapted for Use in the United States, 1965.

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TABLE 2 (CONT.)

LEADING CAUSES OF DEATH AT AGES 45-64 AND 65 AND OVER, BY SEX: UNITED STATES, 1968

Rank	Cause of death[1]	Number	Rate per 100,000 population in specified group
	65 YEARS AND OVER		
	Both sexes		
	All causes	1,189,697	6,219.7
1	Diseases of heart	541,457	2,830.7
2	Malignant neoplasms	176,963	925.2
3	Cerebrovascular diseases	172,969	904.3
4	Influenza and pneumonia	47,060	246.0
5	Arteriosclerosis	32,002	167.3
6	Accidents	28,564	149.3
	Motor vehicle accidents	7,570	39.6
	All other accidents	20,994	109.8
7	Diabetes mellitus	26,119	136.5
8	Bronchitis, emphysema, and asthma	21,690	113.4
9	Cirrhosis of liver	6,950	36.3
10	Infections of kidney	6,720	35.1
	All other causes	129,203	675.5
	Men		
	All causes	613,356	7,488.2
1	Diseases of heart	277,890	3,392.6
2	Malignant neoplasms	98,807	1,206.3
3	Cerebrovascular diseases	75,989	927.7
4	Influenza and pneumonia	24,643	300.9
5	Bronchitis, emphysema, and asthma	17,884	218.3
6	Accidents	14,818	180.9
	Motor vehicle accidents	4,827	58.9
	All other accidents	9,991	122.0
7	Arteriosclerosis	13,686	167.1
8	Diabetes mellitus	9,854	120.3
9	Cirrhosis of liver	4,485	54.8
10	Peptic ulcer	3,785	46.2
	All other causes	71,515	873.1
	Women		
	All causes	576,341	5,270.1
1	Diseases of heart	263,567	2,410.1
2	Cerebrovascular diseases	96,980	886.8
3	Malignant neoplasms	78,156	714.7
4	Influenza and pneumonia	22,417	205.0
5	Arteriosclerosis	18,316	167.5
6	Diabetes mellitus	16,265	148.7
7	Accidents	13,746	125.7
	Motor vehicle accidents	2,743	25.1
	All other accidents	11,003	100.6
8	Bronchitis, emphysema, and asthma	3,806	34.8
9	Infections of kidney	3,475	31.8
10	Hypertension	3,117	28.5
	All other causes	56,496	516.6

[1] Causes are categorized according to the Eighth Revision, International Classification of Diseases, Adapted for Use in the United States, 1965.

From: Health in the Later Years of Life. DHEW Pub. # (HRA) 74-1207. Washington, D.C. 1971.

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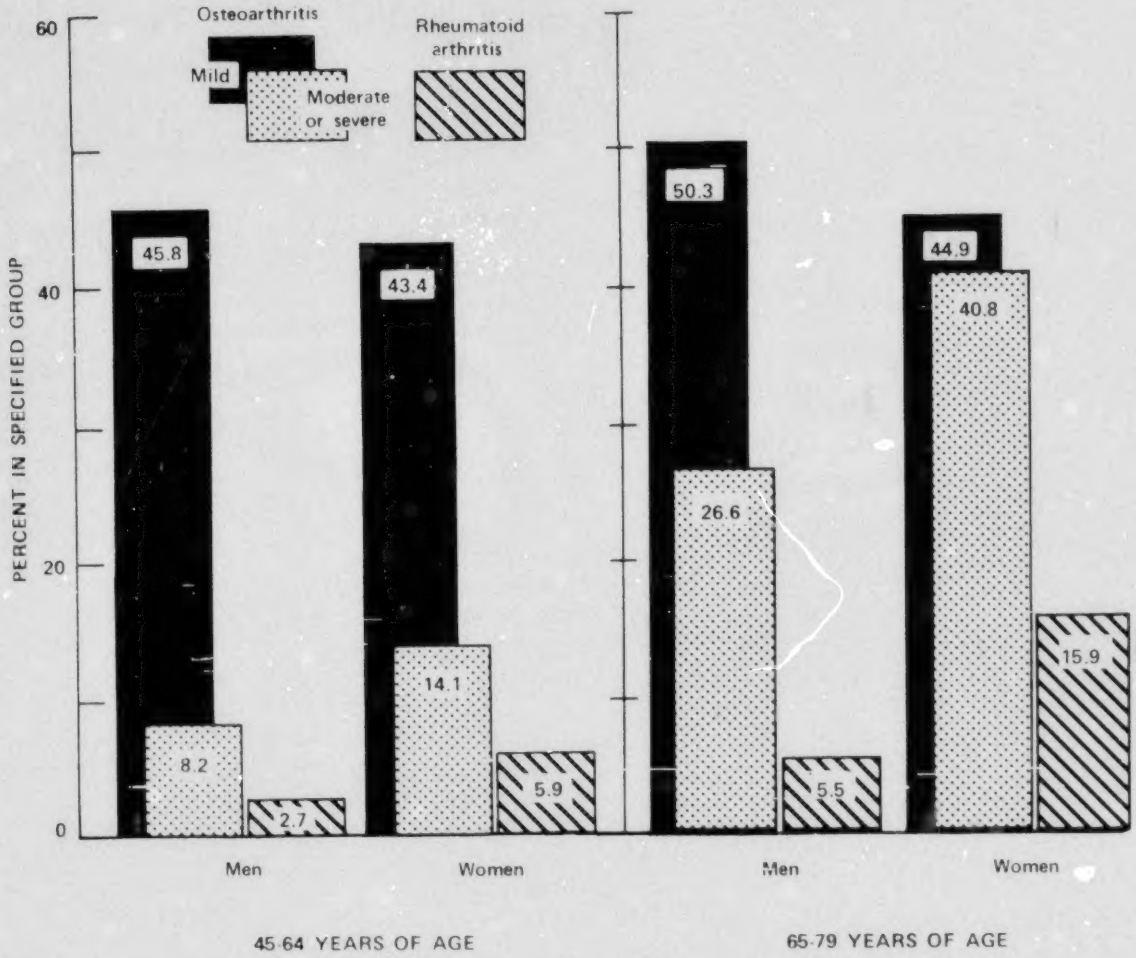
FIGURE 3

PREVALENCE OF OSTEOARTHRITIS (BY SEVERITY) AND OF RHEUMATOID ARTHRITIS AT AGES 45-64 AND 65-79, BY SEX: UNITED STATES, 1960-62



From: Health in the Later Years of Life. DHEW Pub. # (HRA) 74-1207. Washington, D.C. 1971.

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FIGURE 3a

PREVALENCE OF HYPERTENSION AT AGES 45-64 AND 65-79, BY SEX AND RACE: UNITED STATES, 1960-62

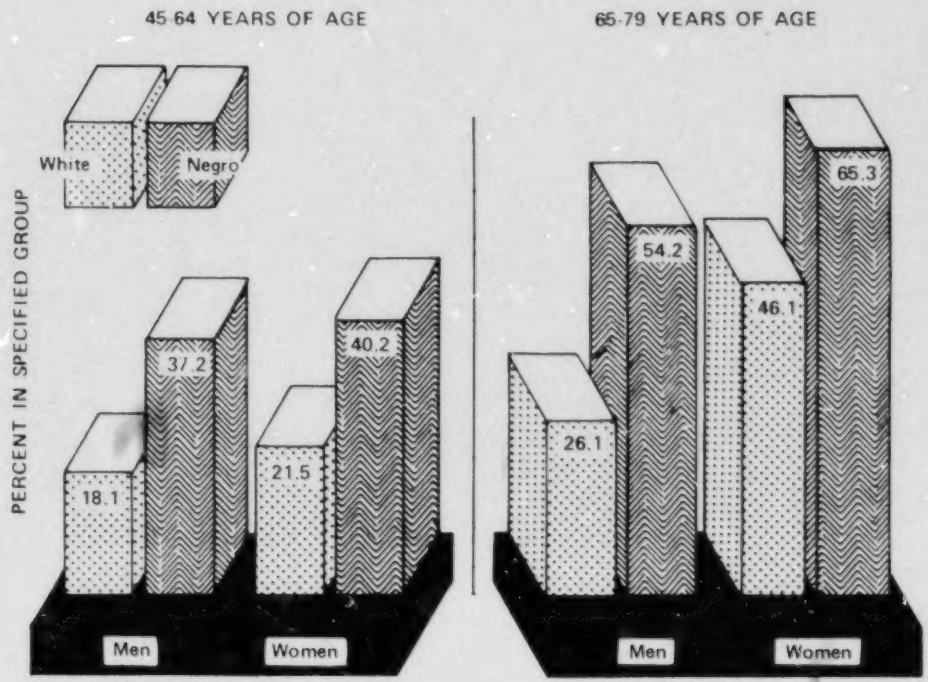

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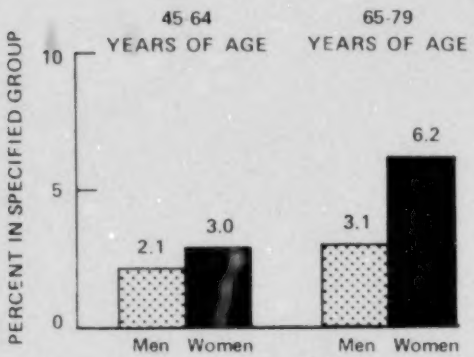
FIGURE 3b

PREVALENCE OF KNOWN DIABETES AT AGES 45-64 AND 65-79, BY SEX: UNITED STATES, 1960-62



From: Health in the Later Years of Life. DHEW Pub. # (HRA) 74-1207. Washington, D.C. 1971

In the beginning of this chapter on the physical aspects of aging, a "typical" description of an aging person was offered. It is hoped that the discussion just completed has provided the reader a factual basis upon which to verify or discard as unfounded his own particular perceptions of the aging process.

AGING--WHY DOES IT HAPPEN?

Do people *have* to grow old and die? The answer would seem to be "yes," for that is the ultimate fate of all forms of animal life on this earth. There must then be some internal mechanism programmed for eventual death, or some deadly flaw in living matter. On the other hand, perhaps the answer is really "no," that actually there is some force in, on or around this planet Earth that *causes* adverse and ultimately lethal changes in living matter to occur. It might seem amazing in this age of technology that the cause(s) of aging is still a mystery, but such is the case. In fact, the reason that most people live longer today than ever before has resulted from reduced infant mortality and control of infectious diseases rather than advances in the prevention and control of the aging process. Indeed, it would appear that very little progress has been made during the past 200 years in deterring the aging process itself. Figure 4 depicts the life expectancy of white males in the United States at the age of 60 from 1789 to 1963. Not much seems to have changed.

Many theories have been advanced over the years as to the cause of aging. No one theory, however, is yet generally accepted as the basis for aging. Some theories, though, have gained greater recognition than others because of their feasibility in fact. The more prominent theories are briefly described below; for the reader wishing more breadth and detail on these theories and others, Bakerman (5), Birren (12), Busse (20), Carpenter and Loynd (27) and Timiras (97) should provide interesting reading.

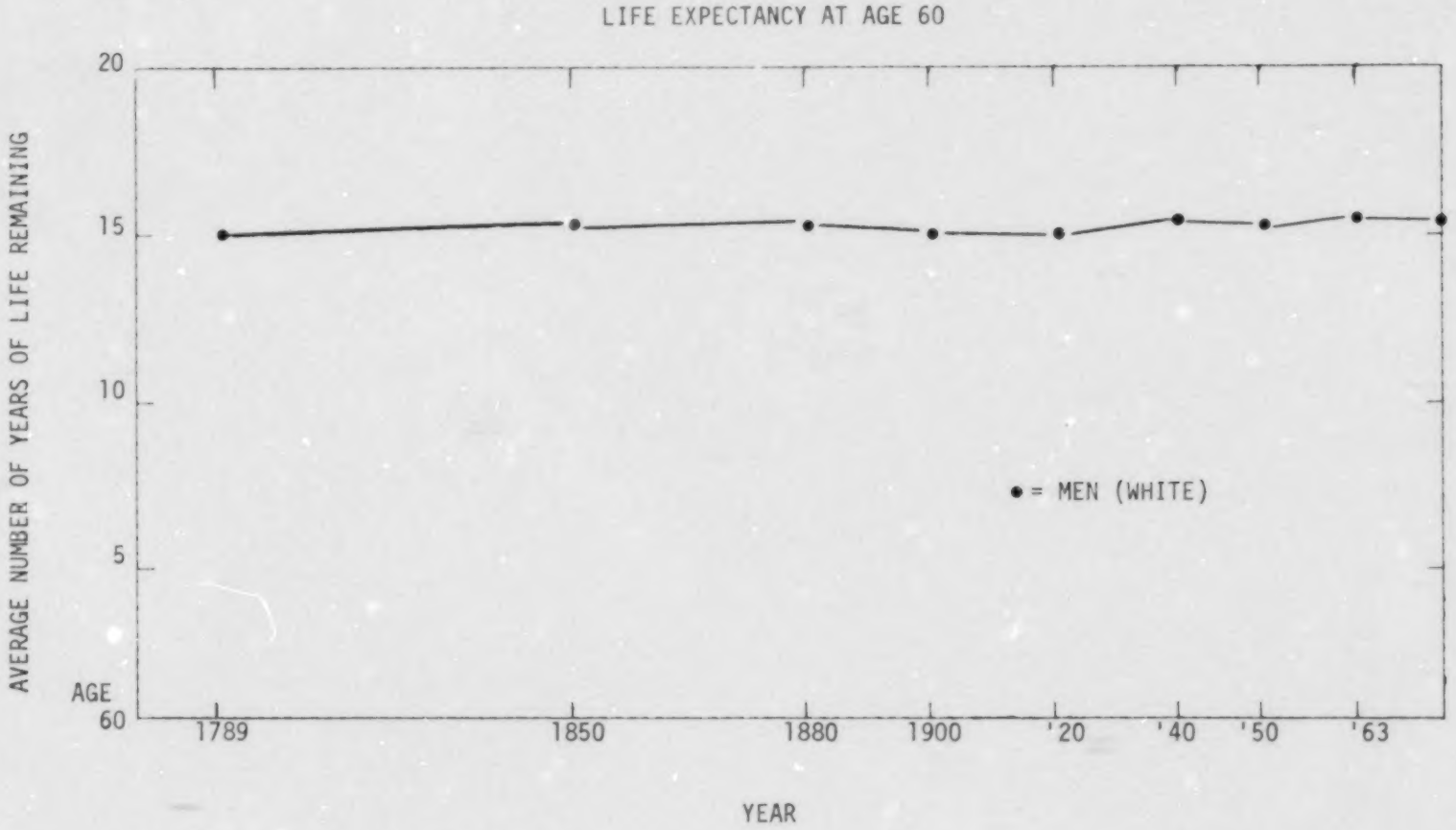
The Cross-Linkage Theory

This theory, first advanced by Bjorksten in 1941 (14) is considered one of the leading theories and thus will be described in some detail. The theory states that large molecules (e.g., proteins including enzymes and DNA) necessary for life processes gradually become immobilized in cells and tissues due to cross-linkage (refer to Fig. 1 for a schematic presentation of the cross-linkage process in collagen.) This immobilization occurs because cross-linkages alter the basic chemical characteristics of the molecules, and they simply cannot function properly. Should DNA become cross-linked, even the cell's inherited or genetic instructions would be changed or mutated. Such changes as these lead to the progressive deterioration of cell or tissue "machinery" and performance and eventual death.

Adding support to this theory has been the discovery of numerous cross-linking agents either present in the human body or to which the body is exposed; examples of these are intermediate metabolites of the Kreb's cycle (the cell's energy producing process); the commonly ingested

FIGURE 4

LIFE EXPECTANCY OF A WHITE MALE IN THE UNITED STATES
AT AGE 60 FROM 1789 UNTIL 1963



From Vital Statistics of the United States, 1963, Vol. II, section 5, Life Table 5-5.

metals, silicon, aluminum, copper and manganese (the latter two being dietary requirements); oxidizing fats (mainly, polyunsaturated fats which are major components of cell membranes) and ionizing radiation (5). With all these substances pervading human tissue, the occurrence of cross-linking is unavoidable. However the body does seem to have some defense against this process; some tissues more than others seem to have the ability to break down mildly cross-linked molecules and resynthesize them into their non-cross-linked state. Thus, the accumulation of cross-linked material is progressive but gradual.

Supportive of this theory is the suggestion that unsoluble waste material is formed by the cross-linking process and that this waste then gradually accumulates (5). This might explain the increasing accumulation of the insoluble lipofuscin or age pigments in aging body tissues. Also, Bakerman's proposal (5) that overfeeding causes the cross-link promoting metabolites from the Kreb's cycle to accumulate and thus accelerate the cross-linking process is most interesting in view of McCay and Crowell's (66) success in prolonging the life of rats by underfeeding them! Moving from rats to men, it is further intriguing to wonder why slightly underweight persons are considered the best life insurance risks!

The Collagen Theory

The collagen theory seems to be based on the cross-linking theory. Noting that with age the amount of collagen present in the body continually increases and gradually becomes cross-linked, this theory proposes that the collagen fibers shrink as a result of the cross-linking and choke off the oxygen and nutrient supply of surrounding tissues, resulting in their gradual dysfunction and eventual death (5).

The Mutation Theory

This theory states that mutation or genetic change in permanent cells, like muscle cells and nerve cells, results in inferior cells eventually incapable of functioning. Of interest here are the findings of Alexander and Connell (1) that chemicals causing DNA to mutate by cross-linking shortened the life span of rats, whereas chemicals causing DNA to mutate by some other means did not cause a comparable shortening of life.

Cybernetic Theory

Observing that there is a progressive decrease in the rate of impulse transmission in nervous tissue, Still (92) theorized that the inefficiency of this critical system eventually resulted in a lack of coordination and finally disorganization of the entire living system.

The Autoimmunity Theory

In 1962, Walford (100) suggested that as age increases large molecules like proteins become so changed in structure that they are

no longer recognized by the body's immunological defenses as being part of oneself and consequently are attacked and destroyed. This idea is consistent with the increase in autoimmune reactions observed with advancing age (16) and also with the cross-linkage theory.

The Free Radical Theory

The basis for this theory is an intracellular reaction called peroxidation. As a result of this reaction, unstable substances like polyunsaturated fats (one component of cell membranes), which are very susceptible to combining with oxygen, have a tiny part of their molecular structure "knocked off." This tiny part, called a radical, flies about the cell with tremendous force, striking other cellular structures and dislodging parts of their molecules, thus creating additional "free radicals." Having studied this process intensively, Harmon (47) lists among the gradual effects of free radical reactions (1) accumulation of age (lipofuscin) pigments, (2) cross-linkage of proteins and (3) degenerative alterations in cell membranes.

Harmon (45, 47) has found support for this theory in his work with animals. He has been able significantly to increase the lifespan of animals fed diets rich in saturated fats, compared with animals fed diets high in polyunsaturated fats. When he fed all of his test animals highly unsaturated diets, but added antioxidants (substances capable of preventing peroxidation of unsaturated fats) such as Vitamin E to half of the diets, those animals eating the "antioxidant diet" outlived the others.

Besides polyunsaturated fats, two substances known to increase free radical reactions are copper and manganese (which interestingly were included among the list of known cross-linking agents presented earlier). In the reverse direction, Vitamin E, Vitamin C and the trace element selenium have been found to inhibit free radical reactions (45, 46, 47).

The proponents of this theory, Tappel (94), Pryor (78) and Harmon (47), among others, propose that the aging process is universal because all life is subject to the effects of cosmic radiation, and radiation has been found to set off free radical reactions. Two supportive observations here are the aging effect of the sun's ultraviolet rays (radiation) upon the skin and the aging of skin, seeming to result largely from the cross-linking process.

The Integrated Theory

Probably the most feasible approach to the cause(s) of aging, in this writer's view, is Carpenter and Loynd's integrated theory (27). In essence, this theory is a combination of other theories. It assumes the major cause of aging to be the cross-linkage of all types of molecules, not just proteins, the rate at which this cross-linking occurs being dependent upon the density of free radical reactions and any other cross-link agents present in or introduced into the body. The results of this cross-linking are of two types: (1) genetic,

such as DNA changes, and (2) nongenetic, such as collagen changes. These changes, in turn, result in (1) defective cells which are no longer recognizable as "oneself" by the body's immunological system and thus are attacked and destroyed and (2) defective cells which fail to function properly and thus impede the designated operations of one body system after another. The inefficiency of one system exaggerates the inefficiency of another, to the point where total breakdown is effected.

In summary, no one theory of aging has yet gained the overwhelming acceptance of the scientific community. In each theory there are bits and pieces of fact along with greater or lesser amounts of conjecture. In some sections of the aging "puzzle," these factual and conjectural pieces seem to fit together well; in other areas, they do not. Some pieces are obviously still missing.

HOW TO DEAL CONSTRUCTIVELY WITH AGING

At the turn of the century, a London doctor offered the following advice for a long life:

> All the organs must be preserved in a condition of vigour. It is necessary to *recognize* and subdue any morbid tendencies whether these be hereditary or have been acquired during life. It is necessar to be moderate in food and drink, and in all other physical pleasures. The air should be pure in the dwelling and in the vicinity. It is necessary to take exercise daily, whatever be the weather. In many cases the respiratory movements must be specially exercised, and exercise on level ground and up-hill should be taken. The persons should go to bed early and rise early, and not sleep for more than six or seven hours. A bath should be taken daily and the skin should be well rubbed, the water used being hot or cold, according to taste. Sometimes it is advantageous to use hot and cold water. Regular work and mental occupation are indispensable. It is useful to stimulate the enjoyment of life so that the mind may be tranquil and full of hope. On the other hand, the passions must be controlled and the nervous sensations of grief avoided. Finally there must be a resolute intention to preserve the health, to avoid alcohol and other stimulants as well as narcotics and soothing drugs (67, p. 141).

A lot of what the good doctor recommended remains valid today, although fortunately additional years of research have provided more specific and expansive advice for the would-be "well preserved long-liver."

Advice for "adding years to life and life to years" as Timiras has so aptly put it (97), seems to fall into several categories: (1) dietary considerations, (2) exercise, (3) personal hygiene, (4) environmental hazards and (5) medical care.

Nutrition undoubtedly affects the aging process, since what is eaten eventually becomes fuel for cells or part of cells themselves or their immediate environment. In addition, various vitamins, minerals and fats might be more than indirectly involved in the aging process.

Of course, the first recommendation regarding dietary practices is always eat a well-balanced, varied diet. Persons who aren't exactly sure what a well-balanced diet is should call their local health department and ask the nutritionist there for assistance. (One could, of course, ask his doctor, but considering the fact that most doctors have had very little training in this area, it seems improbable that they would know more about nutrition than a nutritionist.) Nutrient requirements are thought to remain practically the same throughout adult life except for continually decreasing caloric needs. Therefore to maintain weight, which seems advisable, people must eat less (or exercise more) and still meet the same nutrient requirements as when they were 25 years old. (A notable exception to the nutrient requirement is a decreased need for iron among postmenopausal women.) This becomes increasingly difficult for the average person to accomplish as the years go by.

The gradually decreasing metabolic rate and the tendency toward a more sedentary lifestyle that accompany advancing age account for the decreasing number of calories needed to maintain weight. The average reduction in caloric requirements is 5% between ages of 22 and 35, 3% per decade between 35 and 55, 5% per decade between 55 and 75, and a further 7% decrease after age 75 (42). Maintaining one's weight at recommended levels seems especially important in view of the role that overweight or obesity seems to play in the development of diabetes and heart disease. Also, the arthritic joints and fragile bones that frequently develop with age are subjected to additional stress and breakdown when they have to bear an excessive weight load.

Distributing one's calories over three or more meals per day as opposed to one or two "big meals" also seems to help maintain weight (42, 64). Such a practice also reduces the probability of overloading the blood with fats and sugars for prolonged periods of time. It will be recalled that with increased age, efficient removal of glucose from the blood declines and that fatty deposits on blood vessels increase, perhaps in part due to overexposure to fat.

While the exact cause of osteoporosis, the bone demineralization process, is not known, there is evidence that long-continued insufficient intake of calcium may lead to this condition (73). Many if not most American adults may well fit this description since coffee is their typical beverage, having abandoned that "white kidstuff" called milk sometime in their teens. It would seem good advice to make certain that a liberal daily calcium intake is maintained throughout adulthood. An interesting side note here is the yet preliminary finding that drinking fluoridated water may also help reduce the bone demineralization that occurs with age (10).

The apparent involvement of unsaturated and saturated fats in both the development of heart disease and the aging processes of cross-linking and free radical reactions creates a problem. To avoid heart disease, a diet high in polyunsaturated fat is recommended; to reduce free radical reactions and cross-linking, a more saturated diet is indicated. Considering the fact that there are substances (antioxidants) like Vitamin E, Vitamin C and selenium that protect unsaturated fats from succumbing to free radical reactions, a favorable compromise seems possible. Because free radical reactions and cross-linking are still in the theory stage, it seems advisable to pursue a diet high in polyunsaturates. It has been established that such a diet curtails development and incidence of heart disease (42, 64). At the same time, however, it is advisable to ensure that one's Vitamin E and Vitamin C intake at least meet the recommended daily allowances (42, 98). This may require some special effort, perhaps even a supplement, because recent nutritional studies have shown that even so called "good diets" do not provide sufficient amounts of Vitamin E (19, 42) and that older people tend to become deficient in Vitamin C (98).

A few last dietary comments are in order. During this century the consumption of sugar has doubled, and in recent years, a correlation between sugar intake and heart disease has been observed (106). Also, the mortality rates from cardiovascular disease seem to be higher where soft water is used for drinking (70, 88). Interestingly, copper concentration is higher in soft water than in hard water; and copper has been observed to increase both cross-linking and free radical reactions. Thus, restricting one's sugar intake and drinking hard water may be advisable dietary practices.

The benefits of exercise seem to be exact opposites of the changes that occur with aging. Regular vigorous exercise results in increased oxygen uptake, increased muscle tone and strength, increased flexibility, increased stamina, increased cardiovascular and respiratory efficiency, increased caloric expenditure (a weight-control plus), and decreased susceptibility to cardiovascular disease (17, 44, 57, 52). This is certainly not an exhaustive list, but it is sufficient to confirm exercise as a valuable factor in preserving one's physical capacities. This is not to say that exercise prevents aging; no available data indicate that. However, there are numerous reports that persons who exercise regularly maintain a greater vitality and response capacity to life's stresses than those who don't exercise (18, 31, 41, 44, 52, 72, 85, 95). And it is important to remember that because the majority of people do not maintain a high level of fitness throughout their lives, the data available on aging changes in physical capacity may not really represent aging itself, but rather aging confounded by physical unfitness.

Probably most Americans know that they should exercise more, whether they realize the benefits of such activity or not. However, probably few know how to exercise and how much to exercise; probably even fewer have sufficient motivation to do so. It seems most critical to this writer that educational efforts regarding how and how much to exercise be greatly expanded and that more positive attitudes toward exercise be promoted at all levels of society. As the number of older

people increases in proportion to the rest of society (and America is becoming an older society!), it will become ever more important that these oldsters be as healthy and physically capable as possible. In the meantime, there are available several excellent references on how to remain or become as fit as possible, regardless of one's age; among these are Cooper's *Aerobics* (31), Kasch and Boyer's *Adult Fitness* (52), and the Administration on Aging's publication *The Fitness Challenge* (95). All of these address the how to, where to and why questions on exercise. Considering the potential benefits of exercise in reducing the incapacities of aging, it is hoped that educators will be more responsible in promoting the active life.

Included in a category entitled "personal hygiene," one might expect to find admonitions about bathing and brushing one's teeth; and in fact, these are precisely the points to be discussed. In the section on aging changes, progressive dryness of the skin was attributed to the gradually insufficient production of body oil (sebum) by the sebacious glands. Besides providing a low-grade antibacterial and fungal coating for the body, sebum helps to maintain the suppleness of skin by diminishing water loss from the skin surface. Although hardly recommending a return to the Saturday night bath, Cahn (24) maintains that many Americans overwash and in addition, rinse and dry inadequately. The former washes away body oil faster than it can be replaced, especially by older persons, while the latter two practices encourage bacterial and fungal growth on the skin. Thus for those who prefer to wear a more supple, fresh-looking skin as the years go by, Cahn recommends bathing when you know you're probably "soiled" and not every morning and every night out of habit. In addition, she suggests using bath oils and skin creams to help deter the aging dehydration problem. (For economy's sake, it should be noted here that there's no evidence that hormone creams and the like are any better than plain cold cream or hand lotion.)

So common is the acquisition of dentures or partial plates as one grows older, that only a brief acknowledgement of such dental problems seems necessary. Modern dentists maintain that proper use of dental floss once a day (this is the critical practice), some brushing and good rinsing after as many meals or snacks as is possible should allow most people to avoid becoming "toothless wonders" in their later years (65). Considering the jaw bone recession and facial deformities that toothlessness promotes, this seems like good advice for those wishing to avoid these developments.

Some mention has already been made of the potential aging effects produced by the sun's ultraviolet rays. In a most interesting study of the facial skin of 16 people ranging in age from five to 89, Kligman (54) found that three of the 16 *under* age 10 had already suffered some degree of elastic fiber change in their facial skin, and not one person past 40 years of age had completely normal elastic tissue. However, even in his elderly subjects, samples of skin from areas normally not exposed to sunlight showed only slight elastic fiber degeneration. In addition to the unattractive wrinkling effect of degenerated skin elastic tissue,

excessive sun exposure seems to predispose one to skin cancers (24). Obviously then the sun presents an environmental hazard to those who prefer to minimize wrinkling as they grow older and to avoid jeopardizing their health; fortunately, excessive sun exposure can usually be avoided if one so chooses.

Considering the documented reduced life expectancy of smokers and the comparatively high rates of cardiovascular disease, cancer, emphysema and respiratory infections among smokers (25), there is no doubt that smoking is counterproductive to all other efforts an individual might undertake to ensure himself a long and healthy life. So much material is available to educators on this topic that no additional remarks seem necessary here.

Accidents are likely to occur when people don't pay attention to what they're doing and when they try to lift more, carry more or do more than they're really capable of. The older a person gets the more real each of these situations becomes, not just when he's being inattentive, but all of the time. The previously noted declines in sight, hearing and neuromuscular capacities prevent older people from detecting and then responding to as many environmental factors as they used to, or at least, as quickly as they once did. Thus, as one gets older one might see an obstacle but not be able to react quickly enough to avoid it, or one might not see the obstacle at all. Or, not realizing his diminished strength, the older person may try to lift or carry something he used to be able to and consequently incur some injury.

It is most difficult to revise one's self-image, especially when the new image is one of physical limitations. Nevertheless, this seems to be an important factor in self-maintenance as one grows older, for the phrase "slowed response capacity" also includes recovery capacity, even recovery from minor injuries. As was suggested earlier in the cybernetic theory, malfunction in one body system or part may result in dysfunction of other parts; thus, injury and prolonged recovery time may be disastrously "aging" for the older person.

Finally, regular medical check-ups throughout one's adult years seem to be sound advice. Susceptibility to chronic ailments, in particular, which are usually either eventually deadly or disabling, increases with age. There are yet no cures for heart disease, cancer, diabetes etc., but there is no doubt that early detection allows at least the possibility of minimizing their degenerative effects.

At this point it is not possible to stop or reverse the overall aging process. However, despite the progressively debilitating physical changes that attend aging, it is possible to choose a lifestyle or manner of daily living that minimizes aging changes and/or their effects and maximizes physical potentials at any age.

PART III

PSYCHOSOCIOLOGICAL ASPECTS OF AGING

For the practical purpose of "rounding out" ERIC's rather abundant resources on the psychosociological aspects of aging, this monograph has dealt primarily with the physical/physiological aspect. Nonetheless, in this writer's view, the physical/physiological aspects of aging *are* the fundamental basis for all other aging developments. There is no doubt, considering the inseparability of psyche and soma in their functioning, that the physical aspects of aging can be and are influenced by the psychosociological aspects. In recognition of this interrelatedness, it isn't possible to claim adequate treatment of the physical aspects of aging without at least identifying some of the salient features of psychosociological aging and their relationship with the physical aspect.

PSYCHOLOGICAL ASPECTS OF AGING

For a long time, the textbook view of intelligence has coincided with the popular notion that "what goes up must come down"; thus, with advancing age a decline in intellectual capacities should be expected. As always, however, the results of testing are only as valid and reliable as the tests and testing procedures. So it is not surprising, and even comforting, that recent studies of intelligence changes with age, utilizing more sophisticated tests and techniques, have shown not declines but advances in intellectual capacity, even after age 70 (7, 53, 37). The older a person becomes, the greater become his abilities in verbal comprehension, numerical skills, inductive reasoning (called crystallized intelligence); his ability to shift from one way of thinking to another within the context of familiar operations, e.g., selecting antonyms or synonyms (called cognitive flexibility); and his ability to organize and process visual materials (called visualization). The major exception to these increasing abilities seems to be visuomotor flexibility, which involves tasks requiring coordination between visual and motor abilities. This exception shouldn't be surprising in view of the decreased visual perception and the slowed transmission rate of nervous impulses to and from the brain. Actually this "decline" is probably more a function of "time allowed to complete the task," than an actual loss of ability (7, 22, 53).

So, if intelligence does not decline with age, "*can* an old dog learn new tricks?" The answer seems to be a definitive "yes." In fact, the evidence indicates that persons who pursue learning or who "use their minds" throughout life intellectually outperform those who don't (7, 28, 53). This need for activity seems to be characteristic of all living tissue for optimal functioning; indeed, inactivity, in any body system, seems to lead to atrophy and loss of functional ability--a characteristic of physical aging!

But what does it matter if a person can learn new things in his older years, if he can't remember them? The fact is that memory, long-term

memory in particular, is not necessarily an age-diminished capacity. Many people have sound memories regardless of their age (22, 53). Memory loss seems much more dependent upon *disuse* than age. Short-term memory or immediate recall has been reported to decline with age (8, 28, 53, 90), but it seems quite possible that this is not so much a reflection of lost memory capacity as another example of reduced perceptual capabilities. In other words, the older person may not recall so well what he just saw because he really didn't *see* it very well.

The advice implicit in these findings regarding the aging of intellectual capacities seems to be think, read, learn, analyze--in a word, *use* what's there! It does appear to be important, though, to accommodate slowed processing abilities and reductions in perception by allowing increased time to gain full comprehension and to translate thoughts into action.

What personality changes occur with aging? Cicero seems to have answered this question many years ago. In his *De Senectute*, he wrote, ". . . I am that old age which has its foundations well laid in youth . . . If old men are morose, troubled, fretful and hard to please . . ., these are faults of character, not of age." In essence, old men and women become what they have been. The research available seems to support the observation that the basic adaptational characteristics of one's personality do not change with age. For example, Reichard, Livson and Peterson (79) found five basic personality types among retirees they studied; three of these they ranked as successful personality adaptations and two as poor personality adaptations. In describing these "retired" personality patterns, they noted that the patterns had not been newly adapted upon reaching retirement age, but rather represented the retiree's personalities as expressed throughout their lives. In brief the three so-called "well-adjusted" personalities were: (1) "Mature men" relatively free of neurotic problems who were able to accept themselves realistically in terms of their age-related limitations *and* potentialities. They "made the best of things." (2) "Rocking chair men" who had been rather passive throughout their lives and now welcomed the opportunity retirement brought to be free of responsibilities. For them, the disadvantages of old age were compensated. (3) "Armored men" who maintained a well-developed system of defenses against anxiety. They worked off their fear of physical decline and helplessness by keeping intensely active and involved in life around them. The largest of these groups was the "mature" personality type.

Those retirees called "poorly adjusted" seemed to fall into one of two groups: (1) The largest, the "angry men" were bitter, having failed, in their view, to achieve their goals in earlier life. Blaming others for their disappointments, they were angry about the prospect of growing old. (2) The "self-haters" expressed disappointments similar to those of the angry men, but blamed themselves instead of others. Growing old emphasized their feelings of inadequacy and worthlessness, and they were depressed at the prospect of aging.

The constancy of these adaptive personality patterns throughout life implies the importance of adopting behavior patterns early in life, that all successful and satisfying young people who experience coping or adjustment problems and fail to resolve them will only find their inadequate responses exaggerated by advancing age and its attendant problems.

This is not to say that there are *no* changes in personality with age, for there are. Perhaps the most notable is decreasing ego strength, characterized by withdrawal of emotional investments, decreasing self-assertiveness and reluctance to embrace challenges (71, 53). Also noteworthy is an increasing internality or introspection in the later years of life, becoming more and more evident immediately preceding death.

An often feared aging personality change is the development of senility. Characterizations of senility usually include such symptoms as disorientation, confusion, anxiety, hostility, depression, insomnia, indifference, recent memory loss and so on; and women seem more likely to be affected. Severe cases of senility usually require institutionalization; however, only 1-2% of the total population may be expected to be institutionalized for mental disorders in their old age. Even considering the fact that many senile persons are never institutionalized, it is obvious that senility should hardly be thought of as an inescapable result of aging. The cause(s) of senility isn't known, although severe brain tissue atrophy and arteriosclerotic changes have been blamed by some (53, 82, 97). In view of this, it is not surprising that hyperbaric (high pressure) oxygen therapy has reportedly been "restorative" to at least some persons with symptoms of senility (3, 26). However, organic brain changes and arteriosclerosis do not seem to account for all cases of senility. Depression at and psychological withdrawal from a world that no longer seems to care about the old have been implicated in the "senility" that some, perhaps many, develop (3, 22). Rosenthal (84) captured the essence of this possibility in one question, "Is it senility or sadness?" Supportive of this idea are reports of successes in training (via Biofeedback) older people to increase their EEG alphawave frequencies at will (2). The slowing of alpha-wave frequencies is characteristic of "older" EEG's. Another approach, reporting some success is called "reality therapy" (99). In essence, reality therapy is literally round-the-clock insistence that "senile" patients pay attention to and acknowledge their immediate surroundings, instead of rambling on in a confused manner. That this has been successful for some patients suggests that senility may be a choice, in some cases, rather than a disease.

Two important points seem inherent in this brief look at senility: (1) Maintaining the integrity of the cardiovascular system is most important in avoiding brain dysfunction due to oxygen deprivation; arteriosclerotic blood vessels often can't meet the brain's blood supply (oxygen) demands. (Of course, this applies to preserving *all* of one's mental abilities including intelligence and memory.) (2) Maintaining the integrity of people as they grow older also seems to be critical, not

only to the prevention of voluntary senility, but to all aspects of life in its later years. Emotional sustenance remains just as necessary as physical sustenance throughout life. This fact is not very well recognized or realized in America's youth-oriented society.

In summary, the psychological aspect of aging offers opportunity for continued growth and development. Successful aging in this aspect seems dependent on efforts to maintain physical integrity, acceptance of the limitations that do appear with age and full utilization of remaining capacities. The important and sometimes outstanding accomplishments of the so-called aged throughout recorded history would suggest that those "remaining capacities" are indeed great.

SOCIOLOGICAL ASPECTS OF AGING

What is it like to grow old in America? The excerpts of Rosenfelt's "The Elderly Mystique" presented earlier paint a fairly accurate, fairly unpleasant picture. Linden (58, p. 111) has summarized the nature of America's social orientation toward aging as follows:

> We invest in the future; we plan for the future; we look to the future. We do not invest in things that have no future. In a future-oriented society such as ours, we are generally inclined to withdraw our interest from those people who have a limitation on their future. Neglecting the virtues and pleasures to be enjoyed in day-to-day living and overlooking the continuing possibilities of accomplishment even in great age, we are apt to say that the older person has no future and therefore we set him aside.

Indeed, for most older Americans today, there are no social roles to fill. Society abandons them as useless, retirement representing the formal occasion of society's departure. After retirement, society's attitude toward its older citizens is exemplified by the low priority it gives their income, transportation, housing and health problems, not to mention the psychological problems they often experience from loss of status and purpose in life (60, 59).

Cumming and Henry (32) noted this social withdrawal in their disengagement theory, which has become the major sociological theory of aging. They also observed, however, that the individual himself voluntarily withdraws from society, gradually decreasing his interactions and emotional investments in the outside world, in preparation for his final withdrawal from life. This preparation for death seems to be a necessary stage in life, permitting the individual the time and seclusion to realize and relish the meaning of his life. Thus, Cumming and Henry described social and personal withdrawal as "mutual disengagement."

The mutuality of this disengagement, and certainly its adequacy, both in purpose and result, must surely be questioned today. At an ever younger age, Americans are being *forced* to withdraw from social productiveness and interaction because of compulsory retirement. At one time

retirement may have represented a mutual agreement of withdrawal from society (although retirement age has always been established for political/social purposes, rather than humanitarian), and might still today, were there some useful social role for a retiree to occupy. Since no such roles have been established, the result of this forced withdrawal is premature uselessness, the effect of which can be premature atrophy, physically, psychologically and socially. This result is compounded by inadequacy of pensions, transportation, housing and increasingly needed health care, all of which, by restriction, forces further withdrawal.

The reduction of income upon retirement brings with it a host of problems for older people. Without adequate income, adequate housing, transportation and health care are difficult, if not impossible, to attain (although the availability of these necessities is also an important factor).

In terms of income, people who have been poor all their lives can expect to become poorer in their old age. Even those who haven't been poor before retirement may find poverty their status in life as an older American. In fact, based on the official 1970 poverty index, over 25% of older couples and over 40% of older people living alone have incomes below the poverty level (29). A comparison of the incomes of younger and older persons is presented in Table 3. Comprising only 10% of the total population, older Americans constitute 20% of the poor (29, 22, 39).

Largely as a result of poverty, approximately 30% of the elderly live in substandard housing. Most elderly (about 60%) own their own homes, but don't have the finances to keep them well maintained in their later years. The remaining 30% live in rented tenements, public housing projects, retirement homes etc., many of which may not have been designed to accommodate an older person's physical limitations or needs (53, 22). Such surroundings are hardly conducive to optimal functioning, let alone health. Where construction and facilities are adequate, impersonality and isolation may be depressing problems.

For older people who may no longer be able to drive or afford a car, transportation presents a major restricting problem. In rural areas there may be no alternative to the automobile, while in most urban areas, at least, there is some system of mass transit. However, mass transit requires money, the ability to climb steps, move quickly and adhere to travel schedules which are not always convenient or even decipherable. Consequently, many older people don't get to the doctor and the grocery store when they need to; neither can they visit friends or participate in other social activities as often as they might like.

Health problems increase with age; about 86% of older people suffer from at least one chronic ailment. They require more frequent visits to the doctor and hospital, as well as longer recovery periods (22). Mental health problems also escalate in later years. Depression and hypochondriasis commonly accompany physical ailments, and suicides among

TABLE 3

INCOMES OF OLDER AND YOUNGER AMERICANS

Total money income	Families							Unrelated individuals						
	Total	Age of head (years)						Total	Age (years)					
		14 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over		14 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
Number ..... thousands..	51,237	3,524	10,608	10,884	10,829	8,314	7,078	14,452	1,735	1,537	1,092	1,742	2,724	5,622
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under $1,000	1.6	3.7	1.2	1.1	0.9	1.7	2.6	13.7	22.9	6.1	9.7	11.5	11.9	15.2
$1,000 to $1,499	1.3	1.6	0.8	0.7	0.7	1.4	3.6	12.8	8.1	3.0	4.2	4.5	9.9	22.6
$1,500 to $1,999	1.8	1.9	0.9	0.7	1.2	1.7	6.0	10.6	7.8	4.0	4.3	6.0	7.8	17.2
$2,000 to $2,499	2.4	4.3	1.4	0.9	0.9	2.0	7.9	7.9	7.7	3.8	4.3	6.5	5.0	11.7
$2,500 to $2,999	2.2	3.2	1.2	0.9	1.0	2.0	7.3	5.8	7.1	2.0	3.7	3.1	6.5	7.4
$3,000 to $3,499	2.5	4.1	1.7	1.4	1.4	2.4	7.0	5.1	6.6	4.4	3.7	5.2	6.0	4.6
$3,500 to $3,999	2.7	4.2	2.0	1.5	1.7	2.2	7.0	5.1	7.5	4.1	3.6	5.7	5.8	4.3
$4,000 to $4,999	5.4	9.0	4.5	3.4	3.7	5.4	10.6	7.7	9.5	8.2	8.4	10.9	10.6	4.6
$5,000 to $5,999	5.9	11.0	5.8	4.8	4.1	5.8	8.3	6.7	8.0	11.6	8.2	9.6	7.8	3.3
$6,000 to $6,999	6.4	10.4	7.5	5.4	5.0	6.4	6.6	6.1	5.8	11.8	9.1	8.7	7.8	2.3
$7,000 to $7,999	7.3	11.3	8.7	6.6	5.9	7.5	6.0	5.0	4.1	10.2	10.7	7.8	5.4	1.8
$8,000 to $8,999	7.4	9.2	9.8	7.6	6.4	6.9	4.7	3.4	2.1	8.9	6.1	4.7	3.8	1.2
$9,000 to $9,999	7.0	7.5	9.2	7.5	6.1	7.2	4.0	2.1	0.8	5.3	3.8	2.8	2.6	0.8
$10,000 to $11,999	13.0	9.7	17.0	15.8	13.7	11.0	5.7	3.1	0.8	7.7	7.6	4.8	3.9	0.8
$12,000 to $14,999	13.7	6.5	15.1	17.8	16.8	13.0	4.9	2.5	0.8	5.0	6.6	4.1	3.0	0.8
$15,000 to $24,999	15.6	2.2	12.1	19.9	23.9	17.8	5.6	1.8	0.3	2.8	3.3	3.1	1.8	1.0
$25,000 to $49,999	3.2		1.0	3.6	5.8	5.0	1.8	0.5	-	0.9	0.6	1.1	0.4	0.4
$50,000 and over	0.4	(Z)	0.2	0.5	0.7	0.6	0.3	0.1	-	0.2	-	-	-	0.1
Median income	$9,433	$6,665	$9,499	$10,962	$11,596	$9,648	$4,803	$2,931	$2,748	$6,239	$5,967	$4,696	$3,748	$1,855
Mean income	$10,577	$6,842	$9,942	$11,974	$12,933	$11,353	$6,722	$4,248	$3,164	$6,741	$6,484	$5,557	$4,613	$2,884
Head year-round full-time worker:														
Percent of total excluding Armed Forces	66.6	53.9	77.9	81.6	78.7	67.7	14.0	35.3	30.6	67.8	68.5	61.3	47.8	7.3
Median income	$11,161	$8,091	$10,313	$11,734	$12,600	$11,221	$8,935	$6,246	$5,178	$7,180	$7,171	$6,331	$5,831	$4,687
Mean income	$12,482	$8,366	$10,918	$12,952	$14,100	$13,041	$11,096	$6,926	$5,147	$7,983	$7,827	$7,173	$6,399	$5,910

Source: U.S. Bureau of the Census, 1970d. "Age of Head--Families and Unrelated Individuals by Total Money Income in 1959, for the United States (Families and Unrelated Individuals as of March 1970)." Current Population Reports, Consumer Income (Series P-60, No. 70) Washington, D.C.: U.S. Government Printing Office, p. 4. Table 33.

- Represents zero. Z Less than 0.05 percent.

older people account for approximately 25% of all those reported (80). Increased food prices and difficulty of getting to and from the grocery often means poor nutrition, which by itself can cause or exacerbate mental and physical ills. Poor nutrition among the elderly is considered a major problem (42, 98). Without adequate funds, dealing with these problems can become impossible. The advent of Medicare and Medicaid in the 1960's has helped many older people purchase needed health care, especially those from lower socioeconomic groups (77). But maintaining health still looms as a major problem for most older people.

Older people are supposed to occupy their time and talents with "leisure activities," and indeed, there has been at least some social effort to make such leisure activities more accessible to older people. However, by its very definition leisure is enjoyed in one's *spare time*, when one's duties or work have been completed (53). Thus, one might question just how fulfilling leisure activities are when they become the only thing one has to do. Perhaps the elevated incidence of depression and suicide among the elderly is indicative. Probably most older people welcome freedom from intense responsibility, but it seems unlikely that many welcome no longer being needed.

In discussing his "utility theory of Old Age," Hamlin (43, p. 113) wrote, "For humanitarian reasons, the useless old person must be given something to do. He has no need for extra years; he needs a use for those years. Society must provide busy work and then find uses for this useless activity. Society must learn to need a supply of time it never really wanted." He has a point. Older people represent a wealth of talent and experience that currently is not being utilized by society. Such a loss of investment seems ridiculous and dangerous, considering the pressing social needs of society and the growing numbers of retired people. Perhaps for society to define useful roles for older people would be not only humanitarian but therapeutic for some of its own ills, among which are the "useless" elderly themselves.

Fortunately, America seems to be waking up. In a booklet entitled "Older Americans Are a National Resource," the Administration of Aging has described a number of programs and opportunities through which older people can use their time and talents to provide valuable and needed service to society. Descriptions of these programs and where to get additional information about them are included in Appendix A.

Society is perhaps best served when an individual develops and uses his potential to the fullest extent. Since learning ability seems to have a lifelong potential, the retirement years can offer some real time for mind expansion, development of new skills and learning how to deal with problems as older people. The need for self-actualization doesn't suddenly cease at age 60 or 65. Fortunately, educational institutions at all levels are becoming aware of the educational needs and desires of older people (91), and one hopes this will result in educational opportunities for all regardless of social position.

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APPENDICES

ADDITIONAL RESOURCES

If the preceding pages have stimulated the desire for more information about the aging process, its problems and its potentials, the following resources can be consulted. In Appendix A are descriptions of programs for senior citizens, specifically ACTION programs and Department of Labor programs. An annotated list of materials available free from the Administration on Aging is presented in Appendix B. Also, in Appendix C, the locations of all regional and state agencies on aging are given. They should be able to provide information regarding local problems and programs.

APPENDIX A

PROGRAMS FOR SENIOR CITIZENS

ACTION Programs

From: Older Americans Are a National Resource. DHEW Publication #(OHD/AOA) 74-20810 Washington, D.C.: U.S. Government Printing Office, 1974.

ACTION is the central focus in the federal government for volunteer programs. It administers a number of programs especially for older volunteers and others in which older volunteers may participate.

1. You can become a volunteer in the RETIRED SENIOR VOLUNTEER PROGRAM (RSVP) if you are 60 years of age or older. If you enroll, you will be placed in an activity needed by your community and one which suits your interests. You may work with children, help other older people or the handicapped, or serve in a variety of community programs. RSVP volunteers serve in their community and may be reimbursed for out-of-pocket expenses.

There are 600 Retired Senior Volunteer Programs nationwide. To find out if there is one in your area, contact your State agency on aging or ACTION, Washington, D.C. 20525.

2. You must be 60 years old or older--and also have a low income--to volunteer in the FOSTER GRANDPARENT PROGRAM.

Foster grandparents serve children on a one-to-one basis, four hours a day, five days a week and receive a small stipend for their services.

There are Foster Grandparent Programs all across the country. To find out if there is one in your area, write ACTION, Washington, D.C. 20525.

3. If you are a retired businessman and would like to help owners of small businesses or community organizations which are having problems with management, you may volunteer for the SERVICE CORPS OF RETIRED EXECUTIVES (SCORE). Since 1965, SCORE volunteers have helped more than 175,000 enterprises succeed.

SCORE volunteers receive no pay, but they may be reimbursed for out-of-pocket expenses.

If you are interested in joining SCORE, contact any Small Business Administration regional or district office or ACTION, Washington, D.C. 20525.

4. Older Americans have been serving in the PEACE CORPS, along with younger volunteers, since it started in 1961. Peace Corps volunteers are assigned

to serve in developing countries for two years. They receive a monthly living allowance and, at the end of their service, a cumulative readjustment allowance.

For information on the Peace Corps, call ACTION at 800-424-8580 toll-free.

5. VOLUNTEERS IN SERVICE TO AMERICA (VISTA) is a national corps of volunteers working in urban ghettos, small towns, rural areas, Indian reservations, or wherever there is poverty in America.

VISTAs serve for one year and may reenroll if requested. While serving they receive a monthly living allowance, and are paid a cumulative monthly stipend when they complete their service.

For information on VISTA, call ACTION at 800-424-8580 toll-free.

6. In the spring of 1974, a new SENIOR COMPANION PROGRAM, modeled after the Foster Grandparent Program, will begin. Senior Companions will serve adults with special needs, including the elderly, in their own homes, in nursing homes, or in other institutions, and receive a small stipend for their services.

For information about this program, write ACTION, Washington, D.C. 20525.

Department of Labor Programs

The Department of Labor has been conducting several Mainstream pilot projects providing part-time employment for older people for a number of years. These are:

1. GREEN THUMB, sponsored by the National Farmers Union in 24 States, provides part-time work in conservation, beautification, and community improvement in rural areas or in existing community service agencies. Applicants should have a rural or farming background and must take a physical examination.

Write GREEN THUMB, Inc., 1012 14th Street, N.W., Washington, D.C. 20005.

2. SENIOR AIDES, administered by the National Council of Senior Citizens in 33 urban and rural areas, offers part-time work in community service agencies in a variety of activities from child care and adult education to home health and homemaker services.

Write National Council of Senior Citizens, 1511 K Street, N.W., Washington, D.C. 20005.

3. SENIOR COMMUNITY SERVICE AIDES, sponsored by the National Council on the Aging in 18 urban and rural areas, provides part-time work in

social security and state employment service offices, public housing, libraries, hospitals, schools, food and nutrition programs. Aides also help provide escort services, homemaker and home repair services, and outreach for information and referral.

Write National Council on the Aging, 1828 L Street, N.W., Washington, D.C. 20036.

4. SENIOR COMMUNITY AIDES, sponsored by the National Retired Teachers Association and the American Association of Retired Persons in 31 cities, recruits, trains, and finds part-time work for aides in public or private service programs--assisting in child-care centers, vocational education classes, or in clerical positions and buildings security.

Write NRTA/AARP, 1909 K Street, N.W., Washington, D.C. 20006.

5. OPERATION MAINSTREAM PROGRAM, administered by the Forest Service of the U.S. Department of Agriculture in about 20 States under an agreement with the U.S. Department of Labor, offers employment to older persons on an average of three days a week in conservation and beautification projects.

Write USDA Forest Service, Room 3243, South Agriculture Building, 12th and Independence Avenue, S.W., Washington, D.C. 20250.

APPENDIX B

ADMINISTRATION ON AGING PUBLICATIONS

From: AOA Publications. DHEW Publication # (OHD/AOA) 74-20261. Washington, D.C.: U.S. Government Printing Office, 1974.

AOA Catalog of Films on Aging

A listing of films, slide lectures, filmstrips, and plays on the general subject of aging and specific aspects of retirement living and special services available to the elderly. Indexed by title and subject matter. 64 pp.
DHEW Publication No. (SRS) 73-20277
Also for sale by GPO @ 60¢ SD 1762-00071

Are You Planning on Living the Rest of Your Life?

A preretirement planning booklet to be used at home with your wife, husband, or friend. 72 pp.
DHEW Publication No. (OHD/AOA) 73-20803
Also for sale by GPO @ 60¢ SD 1762-0038

Basic Concepts of Aging: A Programmed Manual

A self-teaching manual on major aspects of aging. Useful to all concerned with aging, as well as a basic text for school use. Prepared by the University of South Florida under an AOA Training Grant. 148 pp.
DHEW Publication No. (SRS) 73-20274
Also for sale by GPO @ $1.25 SD 1762-00072

Consumer Guide for Older People

A wallet card of consumer cautions on such matters as buying by mail, door-to-door sales, signing contracts, etc., with space for local names and phone numbers of helping agencies.
DHEW Publication No. (SRS) 72-20801
Also for sale by GPO @ 5¢ $2.25 per 100 SD 1762-0010

Employment and Volunteer Opportunities for Older People (Dec. 1973)

A 4-page fact sheet prepared to report upon Federal programs offering opportunities for older people in employment and volunteer service.
DHEW Publication No. (OHD/AOA) 73-20733

Facts and Figures on Older Americans, No. 1: Measuring Adequacy of Income (1971)
DHEW Publication No. (OHD/AOA) 73-20181

Facts and Figures on Older Americans, No. 2: The Older Population Revisited (1971)
DHEW Publication No. (OHD/AOA) 73-20182

Facts and Figures on Older Americans, No. 3: Income and Poverty in 1970--Advance Report (1971)
DHEW Publication No. (OHD/AOA) 73-20183

Facts and Figures on Older Americans, No. 4: Federal Outlays in Aging--FY 1967-72 (1971)
DHEW Publication No. (OHD/AOA) 73-20004

Facts and Figures on Older Americans, No. 5: An Overview (1971)
DHEW Publication No. (OHD/AOA) 73-20005

Facts and Figures on Older Americans, No. 6: State Trends--1950 to 1970 (1973)
DHEW Publication No. (OHD/AOA) 73-20007

Facts and Figures on Older Americans, No. 7: Income and Poverty in 1972--Advance Report (1973)
DHEW Publication No. (OHD/AOA) 73-20008

Facts and Figures on Older Americans, No. 8: Poverty by State and Ethnic Group--1969 (1973)
DHEW Publication No. (OHD/AOA) 73-20009

The Fitness Challenge--In the Later Years

An exercise program for older people, developed in cooperation with the President's Council on Physical Fitness and Sports. 28 pp.
DHEW Publication No. (OHD/AOA) 73-20802
Also for sale by GPO @ 70¢ SD 1762-0009

Guidelines for a Telephone Reassurance Service

An authorized reprint of a how-to manual for initiating a telephone reassurance service, including training of volunteers. Originally published by the Michigan Commission on Aging and the University of Michigan-Wayne State University Institute of Gerontology. Spells out in detail how to organize, publicize, and operate such a volunteer program. 24 pp.
DHEW Publication No. (OHD/AOA) 73-20200
Also for sale by GPO @ 25¢ SD 1762-0043

Handle Yourself with Care: Instructor's Guide for an Accident Prevention Course for Older Americans

Provides sufficient material for an instructor not previously versed in accident prevention information. 4 class sessions--3 covering safety in the home; 1 outside the home as pedestrian or driver.
DHEW Publication No. (SRS) 72-20804-IG
Also for sale by GPO @ 50¢ SD 17[illegible]-0012

Handle Yourself with Care

An accident prevention booklet for older people. Related to, but useful without, the Instructor's Guide for an Accident Prevention Course for Older Americans. (See DHEW Publication No. (SRS) 72-20804-IG.)
DHEW Publication No. (SRS) 72-20805
Also for sale by GPO @ 30¢ SD 1762-0011

Home Delivered Meals--A National Directory

A directory of approximately 350 home-delivered meals services listed by States and communities to assist in locating nutrition services for home-bound older people. Provides sources of information to those interested in establishing similar programs. 126 pp.
DHEW Publication No. (SRS) 72-20194
Also for sale by GPO @ $1.25 SD 1762-0039

A Home Delivered Meals Program for the Elderly--A Demonstration

A how-to publication in setting up a meals-on-wheels program similar to the one set up in St. Petersburg, Florida, by the Neighborly Center, Inc., with a demonstration and research grant from AOA under Title IV of the Older Americans Act. Provides detailed forms and guidelines for conducting a home-delivered meals program. 187 pp.
DHEW Publication No. (SRS) 72-20234
Also for sale by GPO @ $1.50 SD 1762-0111

Information and Referral Services: Reaching Out (1973)

A manual outlining steps to follow in developing outreach services as part of an information and referral service. 51 pp.
DHEW Publication No. (SRS) 73-20110
Also for sale by GPO @ 85¢

Information and Referral Services: The Resource File (1973)

A manual on procedures for gathering, storing, and retrieving information about human services. Designed to assist in organizing a resource file for an information and referral service on a non-automated basis. 115 pp.
DHEW Publication No. (OHD/AOA) 73-20111
Also for sale by GPO @ 85¢ SD 1762-00083

Information and Referral Centers: A Functional Analysis (1972)

Examines functions engaged in by information and referral centers and their potential role in supporting the process of planning services for the aged population. Integrates the results of the study into a single model. 47 pp.
DHEW Publication No. (OHD/AOA) 73-20235

Let's End Isolation

Pamphlet on isolation of the elderly and what can be done by individuals and the community to prevent or overcome it. (Slides are available with script from AOA for audio-visual presentation.) 46 pp.
DHEW Publication No. (SRS) 73-20129
Also for sale by GPO @ 30¢ SD 1762-0041

More Words on Aging (1973)

A supplement to Words on Aging of selected 1968-1970 annotated references on aging compiled for AOA by the Library of the Department of Health, Education, and Welfare. 107 pp.
DHEW Publication No. (SRS) 73-20217
Also for sale by GPO @ 55¢ SD 1762-0040

New Facts about Older Americans (1973)

Compact 12-page accordion fold-out of current statistics on older Americans: their numbers, marital status, income, employment, living arrangements, and life expectancy. Also contains map showing, by States, the proportion of population 65+ in 1972.
DHEW Publication No. (SRS) 73-20006
Also for sale by GPO @ 25¢ SD 1762-00081

Nutrition and Aging: A Selected Annotated Bibliography 1964-1972

Lists selected reference materials on aging, nutritional status, nutritional research, illness, nutrition problems, feeding the aging, consumer education, and meal delivery systems. For professionals working with older people, and students interested in gerontology. 42 pp.
DHEW Publication No. (SRS) 73-20237
Also for sale by GPO @ 75¢ SD 1762-00080

Nutrition for the Elderly: The AOA Experience in Development Projects (1973)

Describes, evaluates, and summarizes the major program data, experiences, and findings of 23 Title IV pilot projects in nutrition conducted from 1968 to 1971. Designed to aid agencies and individuals in planning and operating future nutrition services for older people. 96 pp.
DHEW Publication No. (OHD/AOA) 73-20236
Also for sale by GPO @ $1.25 SD 1762-00073

The Older Americans Act of 1965, As Amended Text and Related Acts (1973)

Provides a single source of information on all aspects of the Act as amended on July 14, 1965, July 1, 1967, September 17, 1969, March 22, 1972, and May 3, 1973. Excellent reference for all who work in field of aging and need an understanding of the Act.
DHEW Publication No. (OHD/AOA) 73-20170

Partnership for Older Americans (1973)

Briefly describes projects in U.S. which illustrate variety and extent of public, private, Federal, State and local partnerships that are being formed to provide services for the elderly. 18 pp.
DHEW Publication No. (SRS) 73-20051

Project Helping Wheels (1973)

A how-to book which describes steps that can be taken to develop a transportation program for older people using older volunteers, modeled after Project Helping Wheels in Raleigh and Wake Counties, N.C. 12 pp.
DHEW Publication No. (SRS) 73-20102
Also for sale by GPO @ 25¢ SD 1762-00078

To Find the Way to Services in Your Community (1973)

Helps older Americans find services in their own communities; lists general sources of local help, and where to go--beyond the community--for information and help, including Federal programs to assist older people. Contains a community check list of services and space to record important addresses and telephone numbers. 36 pp.
DHEW Publication No. (SRS) 72-20232
Also for sale by GPO @ $2.60 SD 1762-0042

Transportation and Aging: Selected Issues

Proceedings of the May 1970 interdisciplinary workshop on transportation and aging with recommendations for action by the workshop committee.
208 pp.
DHEW Publication No. (SRS) 72-20232

Words on Aging (1973)

A bibliography of selected annotated references on aging compiled for AOA by the Library of the Department of Health, Education, and Welfare. 190 pp.
DHEW Publication No. (SRS) 73-20216
Also for sale by GPO @ 75¢ SD 1762-0036

Work Study in Social Gerontology (1973)

First edition published in 1970 under title Plan to Span. Reports on a work-study program in social gerontology at the University of Denver, which permits undergraduate liberal arts students to provide direct service to older people in their field experience assignments. 50 pp.
DHEW Publication No. (SRS) 73-20190
Also for sale by GPO @ 60¢ SD 1762-00077

Designs for Action for Older Americans:
Accounts of Pilot Projects, Usually 4 to 8 Pages

A Centralized Comprehensive Program

A project report on a comprehensive, senior, center-based program in Nashville, Tenn.
DHEW Publication (SRS) 72-20906

Countywide Information and Referral

A project report on services of the Council of Social Agencies in Westchester, New York.
DHEW Publication No. (SRS) 72-20907

Employment Referral

Project report on how older citizens in Norwalk, Conn. created an organization to help other elderly people get jobs.
DHEW Publication No. (SRS) 72-20904

Group Volunteer Service

A report on SERVE, a project using older volunteers in Staten Island, New York.
DHEW Publication No. (SRS) 72-20905

Interfaith Opportunity Center of Hartford, Conn.

A report on a center, established by eight churches in Hartford, which multiplied resources far beyond efforts of the individual churches.
DHEW Publication No. (SRS) 72-20903

Psychiatric Care

A report on the Cambridge, Mass. program to meet special needs of older people with mental health problems.
DHEW Publication No. (SRS) 20901

Statewide Community Organization

Tells how a North Dakota statewide community organization project has initiated activity programs through clubs and centers in 73 communities in the State.
DHEW Publication No. (SRS) 72-20908

What Churches Can do

A report on the Satellite Housing Program of Churches in Oakland, California.
DHEW Publication No. (SRS) 72-20900

1971 White House
Conference on Aging
Reports

1971 White House Conference on Aging Report--Toward a National Policy on Aging--2 Volumes (1973)

Proceedings of the Conference held in Washington, November 28-December 2, 1971.

Volume I: Conference background, organization, local and state meetings, delegates and officers, reports of general sessions, and other pertinent information.

Volume II: Findings and recommendations from Conference sessions, and special concerns sections. 440 pp. illus.

For sale by GPO @ $6.75 per set SD 1762-0069

Post-White House Conference on Aging Reports (1973)

2 reports in 1 volume:

Toward a New Attitude on Aging (April 1973).

Presents the Administration's continuing response to recommendations made by delegates at the 1971 WHCoA.

Final Report of Post-Conference Board of the 1971 WHCoA (1973)

Examines steps taken by public and private sectors to carry out WHCoA recommendations; outlines new strategies for accelerating action on those not fully implemented.
Prepared for the U.S. Senate Committee on Labor and Public Welfare and the Special Committee on Aging. 859 pp.

For sale by GPO @ $5.20 SD 5270-01994

How To Order

Single copies of all the publications in this list are available without charge from the Administration on Aging, as long as its supply lasts. To order, please give title and DHEW publication number where there is one.

Send your request to:

Chief
Inquiry Unit
Administration on Aging
Washington, D.C. 20201

In addition, a number of these publications are stocked for sale by the Government Printing Office. Its single-copy price is given in this list. GPO makes a 25 percent reduction in price for 100 or more copies of a single publication sent to a single address. It requests payment by check or money order, made payable to the Superintendent of Documents. Postage stamps and foreign money are not acceptable.
Give title, publication number, quantity; enclose payments and order from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

APPENDIX C

THE ADMINISTRATION ON AGING OFFICES

Regional Offices

From: State Agencies on Aging and Regional Offices: An AOA Directory. DHEW. Washington, D.C.: U.S. Government Printing Office. 1974.

REGION I (Conn., Maine, Mass., N.H., R.I., Vt.)
J. F. Kennedy Federal Bldg.
Government Center Rm. 2007
Boston, Mass. 02203
Tel. (617) 223-6885

REGION II (N.J., N.Y., Puerto Rico, Virgin Islands)
26 Federal Plaza, Rm. 4106
New York, N.Y. 10007
Tel. (212) 264-4592

REGION III (Del., D.C., Md., Pa., Va., W.Va.)
P. O. Box 13716, Fifth Floor
26th and Market Sts.
Philadelphia, Pa. 19101
Tel. (215) 597-6891

REGION IV (Ala., Fla., Ga., Ky., Miss., N.C., S.C., Tenn.)
50 Seventh St. N.E. Rm. 326
Atlanta, Ga. 30323
Tel. (404) 526-3482

REGION V (Ill., Ind., Mich., Minn., Ohio, Wis.)
29th Floor
300 S. Wacher Drive
Chicago, Illinois 60606
Tel. (312) 353-4695

REGION VI (Ark., La., N.Mex., Okla., Tex.)
1507 Pacific Ave., Rm. 500
Fidelity Union Tower Bldg.
Dallas, Tex. 75201
Tel. (214) 749-7286

REGION VII (Iowa, Kans., Mo., Nebr.)
601 East 12th St.
Kansas City, Mo. 64106
Tel. (816) 374-3584

REGION VIII (Colo., Mont., N.Dak., S.Dak., Utah, Wyo.)
19th and Stout Sts., Rm 11005
Federal Office Bldg.
Denver, Colo. 80202
Tel. (303) 837-2951

REGION IX (Ariz., Calif., Hawaii, Nev., Samoa, Guam, T.T.)
50 Fulton St., Rm. 164
406 Federal Office Bldg.
San Francisco, Calif. 94102
Tel. (415) 556-6003

REGION X (Alaska, Idaho, Oreg., Wash.)
1321 2nd Avenue, M/S 620
Arcade Plaza Bldg.
Seattle, Wash. 98101
Tel. (206) 442-2431

State Agencies on Aging

Alabama:
Commission on Aging
740 Madison Ave.
Montgomery, Alabama 36104
Tel. (205) 269-6387

Alaska:
Office of Aging
Department of Health and Social Services, Pouch H
Juneau, Alaska 99801
Tel. (907) 586-6153

American Samoa:
Gov. for Aging Services
Office of the Governor
Pago Pago, Samoa 96920

Arizona:
Division for Aging
Department of Economic Security
2721 North Central
Suite 800
Phoenix, Arizona 85004
Tel. (602) 271-4446

Arkansas:
Office of Aging
4313 West Markham
Hendrix Hall
P. O. Box 2179
Little Rock, Arkansas 72203
Tel. (501) 371-2441

California:
Office on Aging
Health and Welfare Agency
455 Capitol Mall, Suite 500
Sacramento, California 95814
Tel. (916) 322-3887

Colorado:
Division of Services for the Aging
Department of Social Services
1575 Sherman St.
Denver, Colorado 80203
Tel. (303) 892-2651

Connecticut:
Department on Aging
90 Washington St., Rm. 312
Hartford, Connecticut 06115
Tel. (203) 566-2480

Delaware:
Division on Aging
Department of Health and Social Services
2407 Lancaster Avenue
Wilmington, Delaware 19805
Tel. (302) 656-6836

District of Columbia:
Office of Services to the Aged
Department of Human Resources
1329 E St., N.W.
Munsey Bldg.
Washington, D.C. 20004
Tel. (202) 638-2488

Florida:
Division on Aging
Department of Health and Rehabilitation Services
1323 Winewood Blvd.
Tallahassee, Florida 32301
Tel. (904) 488-7798

Georgia:
Office of Aging, Suite 301
Department of Human Resources
1372 Peachtree Street, N.E.
Atlanta, Georgia 30309
Tel. (404) 892-1243

Guam:
Office of Aging
Social Services Administration
Government of Guam
P. O. Box 2816
Agana, Guam 96910

Hawaii:
Commission on Aging
1149 Bethel St., Rm. 311
Honolulu, Hawaii 96813

Idaho:
Office of Aging
Capitol Annex No. 7
509 N. 5th St., Rm. 100
Boise, Idaho 83707
Tel. (208) 384-3833

Illinois:
Dept. of Aging
2401 W. Jefferson St.
Springfield, Illinois 62762
Tel. (217) 525-5773

Indiana:
Commission on the Aging
and the Aged
Graphic Arts Bldg.
215 North Senate Ave.
Indianapolis, Indiana 46202
Tel. (317) 633-5948

Iowa:
Commission on the Aging
415 West 10th
Jewett Building
Des Moines, Iowa 50319
Tel. (515) 281-5187

Kansas:
Services for the Aging Sect.
Division of Social Services
Soc. and Rehab. Services Dept.
State Office Bldg.
Topeka, Kansas 66612
Tel. (913) 296-3465

Kentucky:
Aging Program Unit
403 Wapping St.
Frankfort, Kentucky 40601
Tel. (502) 564-4238

Louisiana:
Bureau of Aging Service DHR
P. O. Box 44282
Baton Rouge, Louisiana 70802
Tel. (504) 389-6713

Maine:
Services for Aging
Community Service Unit
Department of Health and Welfare
State House
Augusta, Maine 04330
Tel. (207) 622-6171

Maryland:
Commission on Aging
State Office Building
1123 North Eutaw Street
Baltimore, Maryland 21201
Tel. (301) 383-2100

Massachusetts:
Executive Office of Elder Affairs
State Office Building
18 Tremont Street
Boston, Massachusetts 02109
Tel. (617) 727-7751

Michigan:
Office of Services to the Aging
Rm. 302, Civic Center
Lansing, Michigan 48933
Tel. (517) 373-8230

Minnesota:
Governor's Citizens Council on Aging
690 N. Robert St.
St. Paul, Minnesota 55101
Tel. (612) 296-2544

Mississippi:
Council on Aging
P. O. Box 5136
Fondren Station
2906 N. State Street
Jackson, Mississippi 39216
Tel. (601) 354-6590

Missouri:
Office of Aging
Department of Community Affairs
505 Missouri Blvd.
Jefferson City, Missouri 65101
Tel. (314) 751-4114

Montana:
Aging Services Bureau
Dept. of Social and Rehabilitative
Services
P. O. Box 1723
Helena, Montana 59601
Tel. (406) 449-3124

Nebraska:
Commission on Aging
State House Station 94784
Lincoln, Nebraska 68509
Tel. (402) 471-2307

Nevada:
Division on Aging
Dept. of Human Resources
Rm. 300 Nye Bldg.
Carson City, Nevada 98701
Tel. (702) 882-7855

New Hampshire:
Council on Aging
P. O. Box 786
14 Depot St.
Concord, New Hampshire 03301
Tel. (603) 271-2751

New Jersey:
Office of Aging
Department of Community Affairs
P. O. Box 2768
363 West State St.
Trenton, New Jersey 08625
Tel. (609) 292-3765

New Mexico:
State Commission on Aging
408 Galisteo Street
Villagra Bldg.
Santa Fe, New Mexico 87501
Tel. (505) 827-5258

New York:
Office of the Aging
N.Y. State Exec. Dept.
855 Central Avenue
Albany, New York 12206
Tel. (518) 457-7321

New York City:
Office for the Aging
2 World Trade Center 5036
New York, New York 10047
Tel. (212) 488-6405

North Carolina:
Governor's Coordinating Council
on Aging
Administration Bldg.
213 Hillsborough
Raleigh, North Carolina 27603
Tel. (919) 829-3983

North Dakota:
Aging Services
Social Services Board
State Capitol Bldg.
Bismarck, North Dakota 58501
Tel. (701) 224-2577

Ohio:
Commission on Aging
34 North High St., 3rd Floor
Columbus, Ohio 43215

Oklahoma:
Special Unit of Aging
Dept. of Institutions, Social, and
Rehabilitation Services
Box 25352 Capitol Station
Sequoyah Memorial Bldg.
Oklahoma City, Oklahoma 73125
Tel. (405) 521-2281

Oregon:
Program on Aging
Human Resources Dept.
315 Public Service Bldg.
Salem, Oregon 97310
Tel. (503) 378-4728

Pennsylvania:
Bureau for the Aging
Office of Adult Programs
Dept. of Public Welfare
Capital Associates Bldg.
7th and Forester Sts.
Harrisburg, Pennsylvania 17120
Tel. (717) 787-5350

Puerto Rico:
Gericulture Commission
Dept. of Social Services
Apartado 11697
Santurce, Puerto Rico 00910
Tel. (809) 725-8015

Rhode Island:
Division on Aging
Dept. of Community Affairs
150 Washington St.
Providence, Rhode Island 02903
Tel. (401) 528-1000

South Carolina:
Commission on Aging
915 Main St.
Columbia, South Carolina 29201
Tel. (803) 758-2576

South Dakota:
Program on Aging
Dept. of Social Services
St. Charles Hotel
Pierre, South Dakota 57501
Tel. (605) 224-3656

Tennessee:
Commission on Aging
Capitol Towers, Fl B3
510 Gay St., Suite B-1
Nashville, Tennessee 37319
Tel. (615) 741-2056

Texas:
Governor's Committee on Aging
P. O. Box 12786 Capitol Station
Austin, Texas 78711
Tel. (512) 475-2717

Trust Terr. of the Pacific
Office of Aging
Community Development Div.
Gov. of the Trust Territory
of the Pacific Islands
Saipan, Mariana Islands 96950

Utah:
Division on Aging
Dept. of Social Services
345 South 6th East
Salt Lake City, Utah 84102
Tel. (801) 328-5579

Vermont:
Office on Aging
Department of Human Services
126 Main Street
Montpelier, Vermont 05602
Tel. (802) 828-3471

Virginia:
Office of Aging
Division of State Planning and
Community Affairs
9 North 12th Street
Richmond, Virginia 23219
Tel. (804) 770-7894

Virgin Islands:
Commission on Aging
P. O. Box 539 Charlotte Amalie
St. Thomas, Virgin Islands 00801
Tel. (809) 774-5884

Washington:
Office on Aging
Dept. of Social and Health Services
P. O. 1788
410 W. Fifth
Olympia, Washington 98504
Tel. (206) 753-2502

West Virginia:
Commission on Aging
State Capitol, Rm. 420-26
1800 Washington St., East
Charleston, West Virginia 25305
Tel. (304) 348-3317

Wisconsin:
Division on Aging
Department of Health and Social Services
State Office Bldg., Rm. 686
1 West Wilson St.
Madison, Wisconsin 53702
Tel. (608) 266-2536

Wyoming:
Aging Services
Dept. of Health and Social Services
Div. of Public Assistance
and Social Services
State Office Building
Cheyenne, Wyoming 82002
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